THE ELECTRICAL WORLD

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Wallace Carbons at the Exhibition.

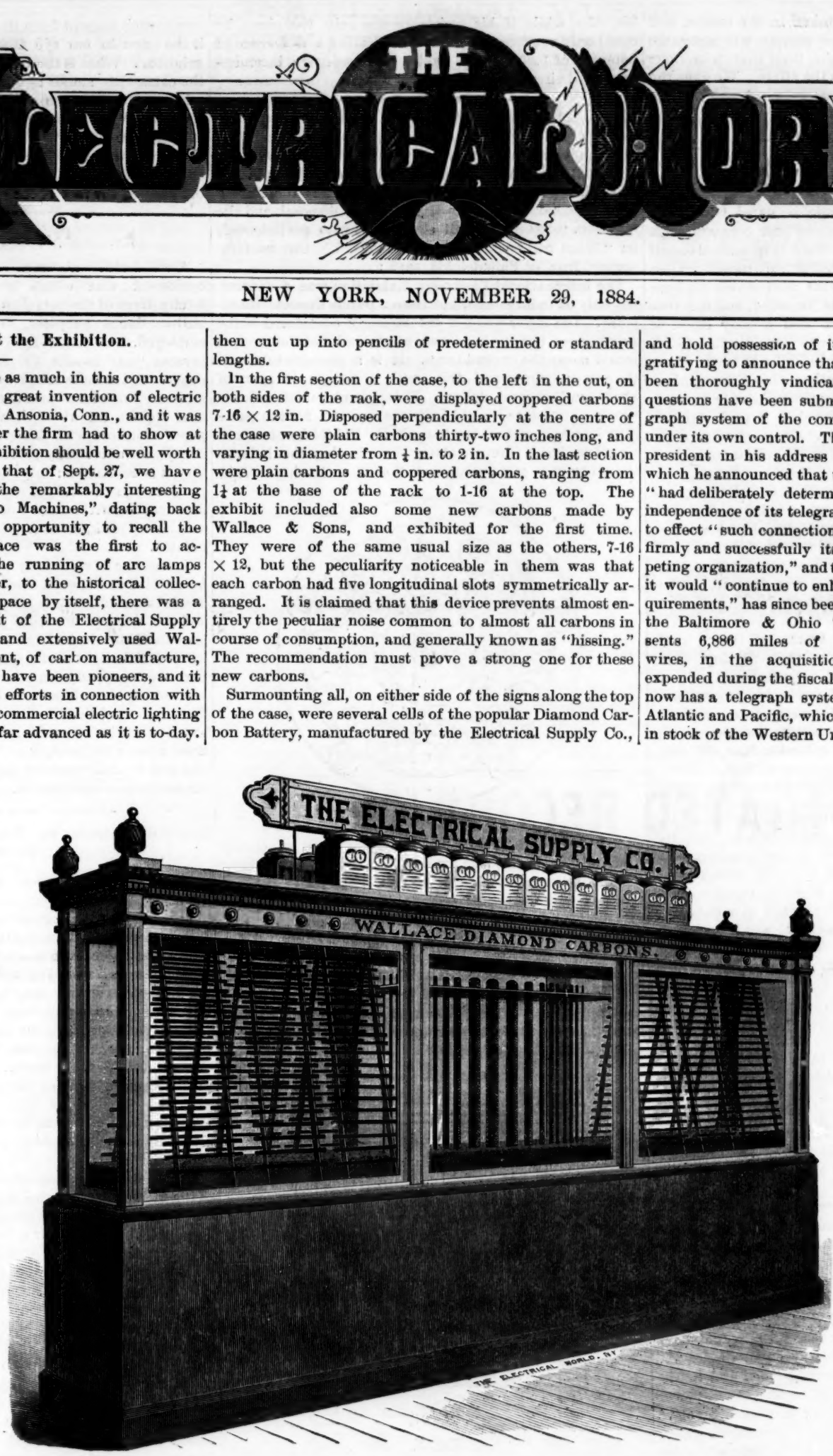
Few, if any, firms have done as much in this country to familiarize the public with the great invention of electric lighting as Wallace & Sons, of Ansonia, Conn., and it was natural therefore that whatever the firm had to show at the Philadelphia Electrical Exhibition should be well worth seeing. In a previous issue, that of Sept. 27, we have described at some length the remarkably interesting exhibit of "Wallace Dynamo Machines," dating back to 1874; and we take the opportunity to recall the claim that Mr. Wm. Wallace was the first to accomplish in this country the running of arc lamps in series. In addition, however, to the historical collection, which occupied a large space by itself, there was a very fine display in the exhibit of the Electrical Supply Company, of the well-known and extensively used Wallace carbons. In this department, of carbon manufacture, as in so many others, the firm have been pioneers, and it is safe to say that but for their efforts in connection with dynamos, lamps and carbons, commercial electric lighting would not be by any means so far advanced as it is to-day.

The progress in the art of making carbons for arc lamps has been very rapid. We need not go back, in order to mark the advance, to the time when Davy used pencils of common wood charcoal for his famous experiments at the beginning of the century; nor even to the year 1844, when Foucault abandoned the use of soft charcoal for hard and compact carbon from gas retorts. It will suffice to point out that half-a-dozen years ago, carbon pencils for arc lighting cost about 25 cents apiece, and that to-day the same articles, or articles even superior in quality, can be bought for three cents each. The reduction of price accompanied by an improvement in the material itself, could only be effected by the adoption of superior methods, and it is satisfactory to learn that practically the margin of profit is little less to-day, on the larger sales, than it was in years gone by when prices were high and the sales were few and far between. Arc lights are becoming so common that their presence no longer attracts attention or excites comment, and, in New York at least, one curious sign of their general distribution is the frequency with which the eye will notice little fragments of carbon sticks lying about the streets, thrown aside by the lamp tenders in their rounds. Had his glance been thus arrested a few years ago by such an object near the sidewalks, it would have caused the casual observer to stop and examine the strange substance closely, not without great wonderment as to its composition and use. If carbons were not so cheap, fragments of them would be rarer and of greater novelty, and arc lighting would not have attained its present grand development.

Our illustration on this page of the case of carbons exhibited at Philadelphia by the Electrical Supply Company, for Wallace & Sons, gives an excellent idea of the exhibit, as in turn the exhibit did of the high pitch to which the process of making carbons has been carried. The methods of manufacture employed by Wallace & Sons are secret, as is usually the case in this line, but it may be said, in passing, that there are two known ways of making carbon points. In one, the plastic carbon material is put into molds, and the molds are subjected to hydraulic pressure. In the other and more common, the soft carbon composed of various ingredients is handled like wire and worked down to the desired diameter by being forced through dies and then cut up into pencils of predetermined or standard lengths.

In the first section of the case, to the left in the cut, on both sides of the rack, were displayed coppered carbons 7-16 × 12 in. Disposed perpendicularly at the centre of the case were plain carbons thirty-two inches long, and varying in diameter from ¼ in. to 2 in. In the last section were plain carbons and coppered carbons, ranging from 1¼ at the base of the rack to 1-16 at the top. The exhibit included also some new carbons made by Wallace & Sons, and exhibited for the first time. They were of the same usual size as the others, 7-16 × 12, but the peculiarity noticeable in them was that each carbon had five longitudinal slots symmetrically arranged. It is claimed that this device prevents almost entirely the peculiar noise common to almost all carbons in course of consumption, and generally known as "hissing." The recommendation must prove a strong one for these new carbons.

Surmounting all, on either side of the signs along the top of the case, were several cells of the popular Diamond Carbon Battery, manufactured by the Electrical Supply Co., the carbons being also a Wallace product. There is no necessity for a description of this style of battery, it being standard in type and reputation throughout the country, and familiar to all practical electricians.



THE WALLACE CARBONS AT THE ELECTRICAL EXHIBITION, PHILADELPHIA.

The Progress of B. & O. Telegraphs.

The fifty-eighth annual report of the Baltimore & Ohio Railroad Company and its attendant enterprises has appeared; and in reference to the latter we quote below the language of the remarkably satisfactory remarks by President Garrett on telegraph, express and sleeping and parlor car organizations:

The policy of the company in owning and operating its expresses, telegraphs, sleeping and parlor cars, elevators, etc., continues satisfactory. The results of operating its own sleeping cars have been 92 per cent. better than when under the control of the Pullman Company, and the gain to this company by operating its own expresses has been 61 per cent. over the period when the lines were controlled by the Adams and other companies.

This company has been engaged for many years in contests with the Western Union Telegraph Company to regain and hold possession of its telegraph property, and it is gratifying to announce that the equities of its position have been thoroughly vindicated on all occasions when the questions have been submitted to the courts. The telegraph system of the company is, therefore, now entirely under its own control. The policy laid down by the late president in his address to the Board in June, 1882, in which he announced that the Baltimore & Ohio Company, "had deliberately determined to maintain the absolute independence of its telegraph system," and that it intended to effect "such connections as would enable it to maintain firmly and successfully its independence as a great competing organization," and that in furtherance of that policy it would "continue to enlarge its capacity to meet all requirements," has since been continuously acted upon, until the Baltimore & Ohio Telegraph system now represents 6,886 miles of poles, and 47,417 miles of wires, in the acquisition of which there has been expended during the fiscal year $2,012,000. The company now has a telegraph system twice as large as that of the Atlantic and Pacific, which was sold in 1881 for $8,500,000 in stock of the Western Union Company, and one and one quarter times as large as that of the American Union, which was sold for $15,000,000 also in the same stock, and by the close of the year it will have a mileage nearly as great as both of those companies combined, whilst the location and character of its lines render them far more valuable. President Bates, of the Baltimore & Ohio Telegraph Company, who has recently inspected the property, states in his report that the lines are thoroughly and strongly built; that the offices are well located, and that the staff is active and efficient. The expenditures for the past year have been made at a time when material was obtained at a reduction of at least 15 per cent. below the lowest prices at which any lines were ever constructed in this country. The system exceeds in capacity that of any other competing telegraph company, and between the two great cities of the East and West is believed to have facilities equal to that of any company. Looking at its cost compared with that of the system of its main competitor, it is believed that it can obtain and hold such a volume of business as will yield very satisfactory net results from the expenditures. The public have already received and will continue to receive advantages and economies from the competition offered by a system of such strength, permanence and magnitude. Since the company commenced its own commercial system in 1877, its telegraph expenses incident to its railroad business have been reduced fully forty-three and one-half per cent., whilst its receipts from railroad business have increased fifty per cent. It is believed when the system of telegraphs created by the Baltimore & Ohio Company has been perfected, that the operating expenses of the Telegraph Department for railroad business will be further reduced.

The Second Safety Lamp Competition.

The syndicate of engineers, directors of collieries and workmen's delegates in France, will shortly issue an announcement containing the conditions under which the prizes in the Second Safety Lamp Competition will be offered. The aim of the Frenchmen is to induce experiments, by offering for international competition prizes of a substantial character. In the mining districts of Great

Britain a good deal of interest is taken in the matter, and if their aid be sought the English miners will subscribe liberally to the fund of $4,000 which their French brothers are trying to raise for advancing the affair. We gave the particulars recently of the unsuccessful results of the late competition of the kind in England.

On Personal Safety with Electric Currents.

BY PROF. A. E. DOLBEAR.

The serious accidents which have occurred within the past four or five years through accidental contacts with wires carrying strong electric currents have seemed to call attention to the necessity of providing safeguards against such mishaps. It is probable that carelessness has been the cause of most of the accidents reported, and it is true that if weak currents only were used nobody could be hurt. It is, however, worth while to consider the electrical relations of the human body in order to learn where danger lies. I have noted in various places the opinions of different persons as to what constituted a safe current. In one of the old books it is stated a "spark eighteen inches long begins to be dangerous." In another place one says that a difference of potential of 800 volts is too high an electromotive force for individual safety.

Now a difference of potential of 1,000 volts will not give a jumping spark the hundredth of an inch long. The electromotive force developed by the Holtz electro machine may be as high as 50,000 volts and the spark from it will at most give a spasmodic jerk to the elbow and no manner of hurt come of it or of repeated shocks from it, so that more than difference of potential must be considered in determining what is dangerous about electricity. The ability of electricity to do work of any kind, destructive physiological work as well as any other, depends upon both difference of potential and current strength, and the amount of work is proportional to the time also. Now the discharge from a Holtz machine through a short wire may give a very strong current; for example, let E = 50,000 volts, R = .001 ohm, then $\frac{50000}{.001}$ = 50,000,000—fifty millions of ampères; but the wire may show no sign of being injured, for the time of the current passage was too short, probably less than the millionth of a second. If the discharge had continued for an appreciable part of a second the wire would have been vaporized. The discharge is probably equally quick when taken on the knuckles, but there is not enough energy to hurt anything. Again, the amount that will traverse any conductor, with a given difference of potential between its ends, will vary inversely as its resistance, and for the human body it may only roughly be calculated. The resistance of the body is very great. Many measurements, made with different individuals taking wires in their fingers and hands, gives a resistance varying between 6,000 and 15,000 ohms; but this depends in a large degree upon the moisture of the skin when contact is made. Hands which are ordinarily dry have a high resistance; the same hands moist with perspiration or purposely wetted may lose half their resistance. Dr. Stone, of London, has made many experiments and finds that the resistance of the body may be reduced to 500 ohms or less, by having the skin soaked.

On an arc light circuit with forty lamps the difference of potentials will be about 2,000 volts. If a man with a dry, thick skin were to grasp the terminals at the dynamo, the current that would go through him would be $\frac{2000}{10000}$ = .2 of an ampère and in one second two-tenths of a coulomb would have traversed his arms. If the same hands were soaked, the current might be $\frac{2000}{500}$ = 4 ampéres, or four coulombs per second. In the first case there would have been spent in him an amount of energy equal to 2000×.2 = 400 watts, or more than half a horse-power, and in the second case 2000×4=8000 watts or $\frac{8000}{746}$ =10.+ horse-power in the interval of one second. Now any electromotive force above about 1.5 volts is sufficient to decompose water, and it has been shown that the fluids of the body are better conductors of electricity than any of the tissue, even the nerves; it may fairly be inferred that such a current with such an electromotive force might decompose a notable quantity of the fluids of the body into their constituent gases.

To determine the highest limit of safety would require experiments which no human beings would be willing to submit to. Animals might be employed perhaps; but if 800 volts have at any time proved to be dangerous, one may set a lower limit to the resistance of the body and determine the current strength. $\frac{800}{1000}$ = .8 ampères. That result looks threateningly large, but it is because the resistance is made so low. I have never found one less than 5,000 ohms, then $\frac{800}{5000}$ = .16 ampères. But that represents 128 watts—a quantity of energy no one would care to have spent in him. After all, what would be safe for one would be entirely unsafe for another; so that each individual would have his own factor of safety, or the difference of potential which he could work with, with impunity. From what we now know it would seem as if one-tenth of an ampère current body was as much as any one could safely have traverse his body for one second. If then he fixes his minimum resistance, the product of the two will give him the E. M. F. which he may feel timidly safe with. Thus, if one's resistance with wet hands is found to be 8000 ohms, then 8000×.1= 800 volts; while if his resistance was only 1000 ohms, he could only venture to touch wires having a difference of potential of 1000×.1=100 volts. The ordinary incandescent light circuit would be on his limit.

The Profits of the Late Exhibition.

It is known that, contrary to the rule in such cases, the late International Electrical Exhibition at Philadelphia resulted in a profit. The Franklin Institute has therefore a handsome balance of over $10,000 at its disposal, and the question, interesting to all electricians who participated, is: "What will be done with the money?" Our contemporary, *Iron*, of Philadelphia, says:

The International Electrical Exhibition was a success, not only as to its merits, but from a purely financial standpoint. The latter was not too strongly considered in the starting-out, but the hope was entertained that the receipts would cover the expenditures. It is a pleasure to record the accomplishment of this, with a margin to spare of about ten thousand dollars. This is not much and not nearly so much as the old Institute deserves for the pains it took and the risks it ran to make the Exhibition, as such, complete, but it is much better than having the balance the other way, and we suppose that the clearing will be

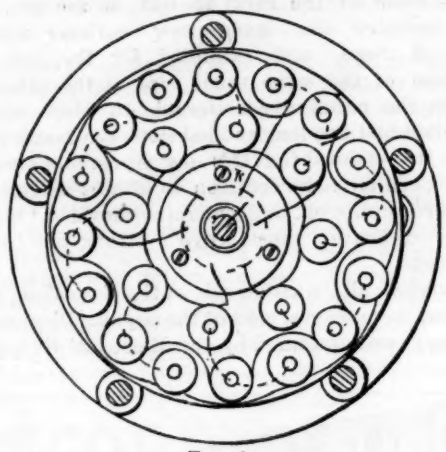


FIG. 1.

added to the "Building Fund" that has been so slowly accumulating for the past several years. In the swift flight of time in this generation, it seems a long while since we wrote our first appeal for these columns, in behalf of this fund: but summing up the time, we find that the slowness with which the debtors of the Institute have responded, has lengthened the view to our eyes. It is a pity that this fund, so much needed in the advancement of the best interests of genuine science, should be allowed to drag at so sluggish a pace. In its present quarters the Institute is severely

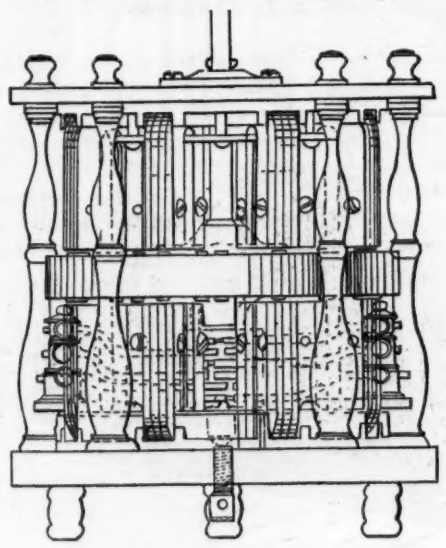


FIG. 2.

cramped, both as to room and facilities, and its capacities for good are consequently and correspondingly narrowed. There should be an end to this. There is no institution in the country that has done more for the encouragement and promotion of science and the mechanical arts, than has the old Franklin Institute. None has held a prouder position in the past and none would hold a more prominent position in the present and future, were its facilities allowed to expand with the necessary demands of the time. The story of the Franklin Institute is that of too many philanthropists. It has done too much for others, and not enough for itself. Its helping hands have always been ready and willing to assist; now, its debtors turn deaf ears and ignore its claims—not to charity, a thousand times not, but to justice.

Just what the Building Fund of the Institute amounts to at this time, we do not know. We have given its total, at different stages, in these columns; but, it certainly has not yet reached the beggarly amount necessary to accomplish the needed enlargement. We use the term "beggarly" because it is best fitted for the case. There is considerably less to be raised to complete the desired amount, than the city of New York will require to finish the foundation of the Bartholdi statue, and we have all joined in the sneer at the thus far futile efforts of the metropolis to secure such amount from its citizens. How much greater is the beam in our eye than the mote in the eye of our neighbor? What is the Bartholdi statue, in comparison to the cause that stands at our doors? The one is ideal, the other real; the one is a breathless image, the other living thought. We can only say what we have said times before. If every one who owes a debt to the Franklin Institute should contribute a single dollar, the fund would swell to such proportions as would erect the proudest Institute building on the face of the globe.

Precious Paraffine.

A wonderful substance is that snowy, pure, tasteless opalescent wax which is evolved from the offensive pitchy dregs of the petroleum still, and marvelous are the multitudinous purposes, arts and uses in which it is employed. A single firm in this city will during the present year handle 350,000 reams of paraffine waxed paper. All articles soiled by absorption of or contact with moisture, no end of products of the air, water and earth that require an air-tight wrapper, furnish uses for the paper saturated with this pure hydro-carbon. Paraffine candles are universally preferred. In the chemist's laboratory it is invaluable; defying agents which can destroy the precious metals and eat up the hardest steel as water dissolves sugar, the most potent acids affect it no more than would city milk, its uses are innumerable, its value incalculable.

In this age of electricity the advent of paraffine might be counted as a special dispensation; it has to-day no successful rival in its class for the insulation of electric wire, and the demand for this purpose keeps pace with the growth of the electric lighting system, and many an overhead electric light cable, or underground conduit, or slender wire, wrapped with cotton thread, owes its fitness for conducting the subtle current to the presence of this wax. The product of the vilest smelling of tars finds its way to the millionaire's mansion, touches his food, polishes his floor, glosses his linen, is an ingredient in his confections and aids to make possible the electric radiance that floods his sumptuous apartments.

Expired Patents on Magneto or Dynamo-Electric Machines.

BY F. B. BROCK, WASHINGTON, D. C.

Two principal objects are assigned for the appearance of this article in THE ELECTRICAL WORLD.

The first object is to assemble in a compact form a complete illustrated record of all expired patents relating to magneto-electric and dynamo-electric machines, which will be of use to our readers, to electrical specialists, and to those contemplating the patenting of their own inventions, as showing the state of progress of this particular art in the United States, as far as magneto-electric machines are concerned the patents for which have expired.

The second object is to bring manufacturers into a closer relation to expired patents relating to this subject.

Manufacturers in general lose sight of the fact that one of the great objects of the patent laws is to bestow upon those citizens who are interested, a free and unrestricted use of an invention after it has received the fostering care of the government for a course of years. It amounts virtually to a contract between the United States and an inventor, with mutual obligations—that of the United States to afford protection to the inventor in its use for a series of years, and that of the inventor to dedicate it to the public use upon the expiration of that term.

All these devices are free to be appropriated by any one so disposed, the term of protection having expired.

In the preparation of this article the phrases magneto-electric and dynamo-electic are used synonymously, a course which is also pursued at the U. S. Patent Office. The article includes all dynamic generators which produce electric currents by magneto-electric induction. The first patent ever granted in the United States for a magneto-electric machine was issued to Messrs. Sonnenburg and Rechten. This was as early as 1852.

These gentlemen proposed to employ magneto-electric induction in the harpooning of whales. The magneto generator was carried in the whaling boat, and the connection between the harpoon and the generator was made by a metallic core in the whaling line.

Quite a unique and spirited drawing was filed with this old patent illustrative of the act of harpooning the whale.

As this magneto device is of the kind similar in arrangement to those commonly used for medical purposes, it is not deemed of sufficient interest to be particularly described.

In the following year Calvin Carpenter, Jr., of Pawtucket, Mass., devised a dynamo-electric machine, of which we give illustrations. Figs. 1 and 2.

Carpenter's dynamo was far ahead of its time, and exhibits a surprising completeness of detail in its construction.

The larger number of the machines in use to-day embody to a greater or less extent either the principle or the arrangement of the Carpenter device.

A series of concentric magnets is disposed in a fixed position both above and below a centrally arranged revolving armature, which is made to rotate in the usual way in a plane between the opposite faces of the magnets. The magnets appear, however, to be permanent, and not electro-magnets. The rotary armature is of wood, carrying a double series of helices electrically connected. To the vertical rotating shaft which carries this armature is secured the 'current discharger" or commutator, having the necessary electric connections between it and the armature. A series of wipers or brushes is arranged in contact with the current-discharger, so as to conduct the electrical energy to the two main binding posts of the machine.

The current-discharger is of cylindrical shape having a

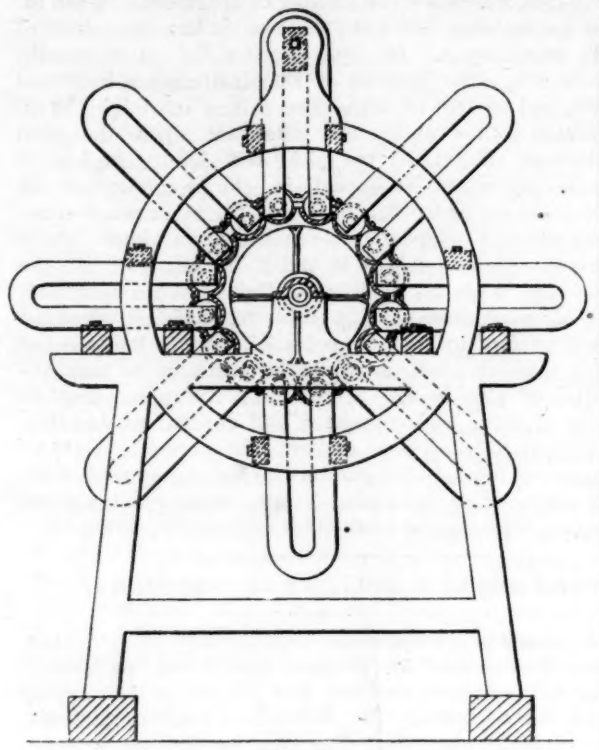


FIG. 3.

horizontal series of metallic contacts in its periphery with intermediate insulated spaces. Each of the series of contacts constitutes a minor current-discharger, the whole series forming the commutator and uniting all their broken currents in a single unbroken one.

The magneto-electric machine of Edward C. Shepard, of New York, was patented in 1856. Figs. 3 and 4.

Like Carpenter's dynamo the several magnets are permanent, with their ends placed in the planes of several

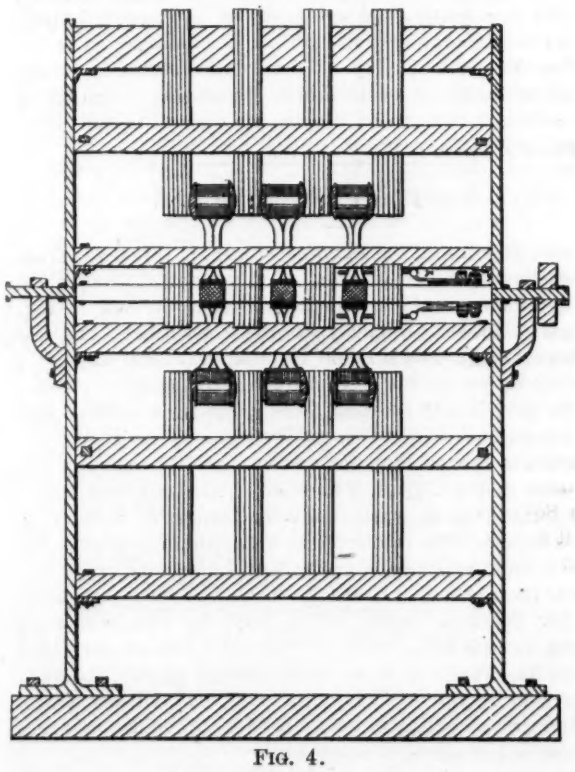


FIG. 4.

vertical circles. Between every two of these circularly arranged magnets is mounted an armature wheel having a series of helices arranged to pass between the sides of the ends of the magnets in creating the induced electric currents.

The polarity of the magnets is arranged in the usual way. In like manner the north pole of a magnet in one circle shall always have a south pole opposite to it in the magnets on each side. The several armatures are keyed to a central revolving shaft, which is driven by the motor.

By making the connections with the proper ends of the wire of the helices, all the currents of the helices for the time being in action may be united together, forming one current. There must, of necessity, be separate break-pieces and commutators, because the reversions do not take place at the same time.

Geo. W. Beardslee, of Flushing, N.Y., devised two electric generators, the patents for which have expired.

In his first device he employs two oppositely-vibrating conductors, insulated from each other and simultaneously operated by the alternately reversed currents from the dynamo. These conductors vibrate between two other sets of conductors, each set of which is connected with one of the terminal wires of the magneto-electric machine, so that each vibration shall break the connection between one of the vibrating conductors and one of the terminal wires and establish the connection with the other terminal wire of the machine and *vice versa* with the other vibrating conductor.

A sectional elevation and a sectional plan view is given of the Beardslee device. Figs. 5 and 6.

The two pairs of electro-magnets shown in the latter view are connected with the magneto-electric machines. By reason of these connections the cores of these electro-magnets are rendered magnetic with the poles, alternately changed as in the magneto. Between the oppositely facing poles of the two electro-magnets hang the poles of a permanent magnet which is suspended, pendulum like, to an arbor journaled in the frame. As the poles of the electro-

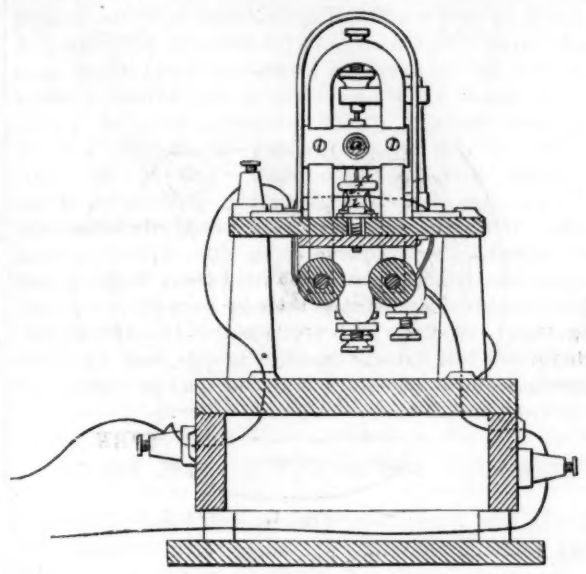


FIG. 5.

magnet are alternately changed, the permanent magnet will be alternately attracted and repelled, and by that means will be vibrated as rapidly as the poles are changed.

In 1854, Mr. Davis patented a hand magneto-electric machine and which preceded the Shepard machine before described in date. It embodies a similar principle of construction to those here described, but was mainly designed for medical purposes.

Mr. Calvin Carpenter, Jr., also devised a similar machine in 1856.

Preceding Beardslee's inventions above described, in 1859, Messrs. Burnap & Bradshaw and Marshall devised magneto-electric machines, chiefly for medical purposes.

The second dynamo-electric machine devised by Beardslee embodies a horizontally revolving wheel of permanent magnets formed of a series of radial bars connected at their inner ends by a continuous ring, forming a compound magnet. Each compound magnet has a series of

FIG. 6.

poles radiating from the central portion of the plates like the spokes of a wheel. These magnets are all clamped together in their respective places between two disc-hubs having a screw adjustment.

This construction is clearly apparent from the vertical sectional view here given. A horizontal sectional view is also shown. Two series of separate wheels of these radial compound magnets are arranged at different horizontal planes. Between these wheels are circumferentially disposed, in stationary bearings on the frame, a series of helices constituting the armature. Figs. 7 and 8.

Beardslee also arranges fixed bonds or rings for receiving the induced electric impulses, and which consists in combining with the rotating compound magnets one or more insulating-rings of non-magnetic metal, placed outside the circle of rotating magnets with which the terminal wires of the helices are to be connected. By this construction the connection and disconnection can be readily made, whether the machine be in motion or at rest.

By referring to the horizontal or top view it will be seen that the plates of the radially arranged compound magnets are formed from a circular plate or disc, by cutting out a succession of V-shaped pieces from the periphery, leaving a continuous ring around the hollow centre, with the series of magnet poles radiating therefrom like spokes from the hub of a wheel.

Nothing Wrong with the Light.

One evening last week the electric lights of the Hell Gate tower failed to shed their brilliant rays, and the wise, old fogy heads and tongues wagged as they chuckled over the failure of the "new fangled notion," and predicted that it would be "just so every dark, stormy or windy night. When lights were most needed they would blow out."

Rain, wind or storm can no more extinguish the electric

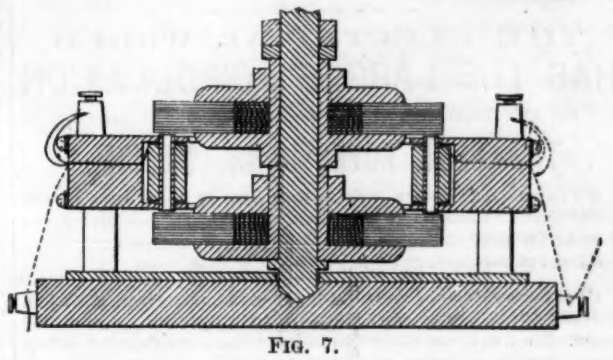


FIG. 7.

light than man can snuff the moon with his fingers. There is nothing wrong with the light, and if gas lamps or old-fashioned "penny-dips" were at the top of that tower it would be necessary to reach them in some way and apply flame in order to produce illumination. The whole trouble and the requisites for prevention of such accidents in future is told by the following from the New York *Sun:*

The lamps of the Hell Gate electric light tower are stationary, and the man who attends them travels up skyward every day in a skeleton elevated car to get at them. To keep his car from swaying in the stiff breezes that blow over the point, two guide ropes of steel wire three-quarters of an inch thick are stretched from the bottom to the top of the tower, and fit in grooves at diagonally opposite corners of the car. The steel rope by which the car is elevated runs over a balance wheel about half way between the top and bottom of the tower, and usually works so smoothly that the car glides to the top by its own momentum after a single push given from below.

The rain that beat against the tower on Wednesday froze as it touched the ironwork and steel ropes, and when Lamplighter Fox stepped in the elevator car the guide ropes were covered with ice. It required the assistance of two engineers to get the car started. When it got up about sixty feet it stuck fast, and although four men on the ground yanked the rope with all their might they couldn't

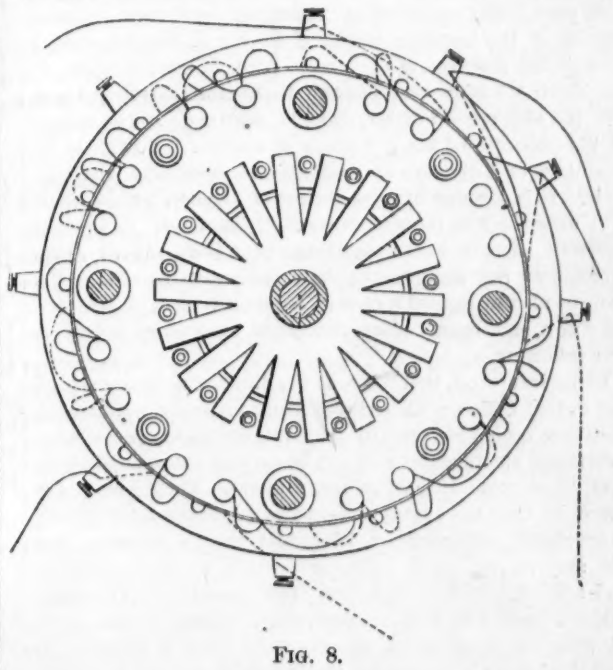


FIG. 8.

budge it an inch. They kept tugging away for ten minutes before they gave it up, and then pulled an instant the other way, and the car slid down like a sledge going down an ice hill.

"That settles it for to-night," said Mr. Fox: "the carbon sticks are burnt out, and it don't give any light."

All Wednesday night and yesterday the ferry hands at the Astoria ferry were kept busy answering questions as to what was the matter with the light. All but one of the ten lights were ablaze last night.

"The lights will be out every cold night this winter," said an Astoria engineer, who had been studying the tower machinery, "unless the managers change the present system of running the lamps. Nothing but a steam engine can force the elevator up to the tower top when the guide ropes are covered with ice. The lights ought to be arranged so that they could be lowered to the level of the engine room."

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NEW YORK.

NEW YORK, NOV. 29, 1884.

PATENT OFFICE DELAYS.

The members of the American Institute of Electrical Engineers who attended the meeting last May will remember the forcible letter then read from Examiner C. J. Kintner on the state of the Patent Office; and those who attended the September meeting at Philadelphia will also remember the interesting paper that he then presented on the Patent Office in its relation to inventors and their needs. Mr. Kintner described the manner in which the office does its work, and showed how the duties were so heavy that the force of 550 employés could not begin to cope with them. Writing in March, he said: "We are getting deeper into the mire each year," and speaking in September he drew a graphic picture of the hopeless uphill endeavor of the examiners to wipe off the arrears of work. And in confirmation of Mr. Kintner's statements at the September meeting, there was the able speech of Mr. Jannus, who said in the course of his exposure of the condition of affairs: "You go to an examiner of a division and ask about a case. He will refer to it. It is among fifty packages of papers, perhaps half way down. You inquire when it will be ready. He looks ruefully at the books and replies, 'Well, about three months or so,' and that is the best you can do." Mr. Jannus also instanced a case of his own which, if we mistake not, had been before the office two years before it was taken up.

Being informed, therefore, of the difficulties under which the Patent Office, with an insufficient force and with small, scattered quarters, tries to perform its highly important functions, electricians will not be greatly astonished at the complaints now filling the newspapers. They know, for example, that the arguments in the telephone interference cases closed in November, 1881, and that a decision was not arrived at until July, 1883, only to be confirmed, on appeal, within the last few weeks. In comparison with this the complaint seems very trivial that an assignment of territory took a month to record, although the actual work would occupy probably less than half an hour. One serious complaint has been made in regard to the issue of patents on devices which are not new but have been known in the arts for some time, and specific instances are named of a carrying-jack in use thirty-five years and a steam engine cross-head, in use fifteen years. All the various points of criticism may be justly met by the reply of the office, that it is not enabled by Congress to perform its work satisfactorily; but it is the place of Congress to see that the office shall have no such excuse to fall back upon. As far as can be learned, Commissioner Butterworth has been doing all in his power to expedite the work of his department, and Mr. Kintner stated that the manly refusal of Mr. Butterworth to make cases "special" had at last forced upon Senators and Representatives the conviction that the Patent Office must have an increased force. His refusal to help them in cases of interest to themselves and their friends made the appeal for help personal, and thus it is that the force has been strengthened ten per cent. The rule for "specialing" cases has its advantages no doubt, but the time has certainly arrived for putting down the abuses of it.

Why the Patent Office should suffer in the way it does, is more than any one can comprehend. The terrible fact is not to be concealed that at the end of last June the applications awaiting action numbered no fewer than 9,186, or 5,087 more than were awaiting action at the corresponding date in 1883. These arrears of work are downright shameful, and yet over against them stands the other fact that the Patent Office pays its way out of inventors' fees from year to year, and has had a surplus nearly every year of the last fifty. The average annual surplus for the five years down to the end of 1883 was $286,000 in round figures, and for the year 1883 was over 40 per cent. of the receipts. When we look at the vast and incalculable benefits gained by the civilized world, and especially by this country, from patented inventions, it is impossible to refrain from expressing indignation at the treatment thus accorded inventors and those who help them within the Patent Office or outside its walls.

The delay that is inflicted upon inventors by the present condition of things is a serious hindrance to invention. A man who, having exercised his ingenuity and struck upon a happy idea in a new line, discovers that he cannot secure protection under a patent without a delay of a year or two, or else that somebody is allowed to step in before him, is discouraged, and is, we fear, but too often led to abandon the prosecution of his work. What the inventors want—and therefore the best interests of the country—is not alone a liberal patent law, but a convenient, suitable Patent Office building and a force double the present muster to keep pace with the new cases. We know of several electrical inventions suffering from this delay, and write in the hope that the efforts for reform made in Congress at the last session will be renewed with better success this session.

ELECTRIC LOCOMOTION IN NEW YORK.

It would be interesting to know just when all the talk about applying electricity to the elevated railroads and the Brooklyn Bridge will result in actual work. The public has now been informed that experiments are to be made on the Second Avenue line, and that a central rail will be laid for the purpose from Chatham Square to Harlem, that the rival companies will all have a chance to show what they can do, and that these companies will have to contribute toward the expense of laying the central rail. The Daft people are meantime to make a test on the Brooklyn Bridge.

We confess that all this palaver and bother about experiments tires us. The adaptability of electric currents to locomotive purposes has been so often and so successfully shown that one wonders why here, in progressive America, with all our boast of needing only to see a good thing in order to adopt it, the railroad companies still ask and ask for "experiments." To-day in Europe a dozen electric railways are working admirably, and more will soon be in operation, while already in this country the Daft, Knight-Bentley, Field, Edison and other systems have all given proof of their feasibility. Whatever may be the reason for this dilly-dallying, it is a poor one, and the experiments are, in our opinion, mere waste of time and money. It is said that some of the competitors on the elevated roads require from thirty to sixty days to get ready. That may be well enough, but we believe that reputable and responsible electrical companies could be found at this moment to make a contract to run motors in the regular way of traffic within that period and to give a guarantee of successful performance. Why, then, all these useless "experiments" repeated over and over again? It may be that the saving would amount to so large a sum annually that before venturing on the change, some influential persons would like to own a little more stock before it goes higher.

THE EUROPEAN TELEGRAPH CONFERENCE.

A recent cable message from London states that the Chambers of Commerce of London, Liverpool, Manchester, Paris and Marseilles have been exchanging communications with the object of taking joint action at the telegraph conference soon to be held. The dispatch adds that the denials by the telegraph companies of various restrictions and curtailments of present facilities are distrusted by the Chambers named, and that admission to the conference will be asked for commercial representatives.

The above statements may need a little explanation. The conference in question is to take place early in 1885, at St. Petersburg, and it would appear that the various telegraph administrations of Europe, public and private, will participate. The report has gained wide circulation in Europe that one action of the conference would be the adoption of new rules affecting injuriously all firms and persons using submarine cables. It has been understood that the cable companies would make an effort to reduce the limit for code words from ten letters to eight, and the estimate is that the limitation would be equivalent to not less than an increase of 25 per cent. in rates. The number of words available would be cut down, and hence, where one code word of ten letters sufficed before, two of eight would have to be sent in using the smaller code. This and other rumored changes and reported limitations of privileges heretofore enjoyed have excited commercial circles in Europe, and are still alarming business men, although the companies have ridiculed the statements. It is evident that new regulations of some kind are intended; and probably the Chambers of Commerce will best consult the interests of their members by watching the conference when it meets.

THE OUTPUT OF BELL TELEPHONES.

It is a sign of the late dullness and depression in trade that the output of Bell telephones for the month ended the 20th inst. was below the number of instruments taken in, the figures being 1772 and 2107, or a net loss on output of 335 instruments. In 1883, during the same month, there was a net increase of 3811 instruments, in 1882 of 5033, and in 1881 of 4943. The falling off might be attributed to the uncertainty attendant upon the great telephone litigation; but this will hardly explain it while the stock is quoted in the neighborhood of 200 and remains strong. Moreover, the average subscriber who wants a telephone does not distress himself about litigation connected with it, and if he wants to join the exchange in his city he does so. Taking the country as a whole, many men have probably relinquished telephone service temporarily on the reflection that, as business has been without profit, it would be judicious to save the rental of $100 or $150 per annum. The approaching revival of trade and commerce will not fail to stimulate telephony to a material extent. The occasion might be improved, to use pulpit parlance, in looking up fresh fields for telephone service and in devising cheaper but not less profitable means and methods of exchange operation.

THE SWEET SIMPLICITY OF "MOTORMAN."

A portion of our space has been devoted lately to vivacious discussion of the proposed new word "motoneer," intended to describe the man who attends to the working of an electric motor. The matter is in itself insignificant, but it is felt by many that, after adopting the word, a deluge may come of other words equally bad, and hence earnest voices are raised in protest. To-day we publish another letter on the subject, from a gentleman who would prefer to refrain from writing, but whose soul is vexed and filled with exceeding bitterness at the appearance of "motoneer" in print. Our esteemed correspondent points out that to derive "motoneer" from the misapplied word "engineer," is but making confusion of tongues worse confounded, and he offers the practical suggestion that "motorman" be adopted as answering all the requirements. We think that the word, though unpretentious, hits the idea neatly, and unless it can be improved upon, we would recommend its general acceptance. The discussion has been timely. It has called attention to the prevalent looseness of technical phraseology, and gives electricians a new word just as the age of motors seeks for it.

PROTECTING BROADWAY.

Mayor Edson seems determined to protect Broadway from the indignity and obstruction of a surface railway. He has again vetoed the resolution of the aldermen of this city giving to the Broadway Surface Railroad Company the franchise for that noble thoroughfare, and says: "I desire to repeat the conviction I have frequently expressed that to permit any railroad to be built in Broadway will prove a serious error. This noble avenue is the great thoroughfare of our metropolis, and as a public highway has no equal in the United States; it is the only continuous and uninterrupted street running from the Battery to Union Square; its character as a commercial centre has made it famous throughout the world; its easy grade and central position make it the natural and necessary highway for the vast traffic of the city, for which now no other avenue is left." This is well put. The proper rapid transit for Broadway is an underground electric railway, which will be provided sooner or later, and will not injure the appearance of the street or hinder the enormous business carried on along it every day.

THE PRESIDENTIAL ELECTION RETURNS.

The seriousness of the charges brought against the Western Union Company of helping to falsify and withhold the election returns of this State has led Dr. Norvin Green, the President of the company, to publish an address or explanation in the newspapers making a very positive and indignant denial of the accusations. The points raised by him are much the same as those made on this page two weeks ago, and he says: "We simply took the Associated Press bulletins as that Association made them up and delivered them." As regards the Indiana returns complained of, Dr. Green promises an investigation, it being demanded by the officials interested, for their own vindication. The New York *Journal of Commerce* promises also a searching and exhaustive investigation into the work done during election week by the New York office of the Association.

The Growth of Electrical Nomenclature.

It is evident that the rapid growth of electrical nomenclature, referred to editorially by us last week, is exciting general attention. The last number to hand of the English *Mechanical World*, expresses its views in the following manner:

"We have over and over again, to the point of disgust, condemned the confusing and irreverent practice of drawing-room electricians who seek to advertise themselves and air their pedantry by professing to have found some nameless quantity to which they stand sponsors most sacrilegiously by dubbing it with the names of some illustrious dead. In electricity as in mechanics there are three fundamental units—of mass, space and time. In mechanics it is found easy to get along with the pound, foot degree, and second with one or two simple derived units, such as "horse-power," which explain themselves; with electricity, on the other hand, although equally simple and explanatory names for derived units might be employed, the case is very different. The scientific electrician cannot explain himself without, in addition to the fundamental units, employing such measures as the dyne, erg, volt, ohm, ampère, mho, coulomb, watt, joule, farad, weber, preece and latest, the gauss, in all 13 units, in addition to their multiples, such as the euphonious megfarad or microhm; and we may add that he can explain himself less with such an embarrassing nomenclature. Professor Sylvanus Thompson is the last in the field with the "gauss," which is the unit of measure of the intensity of a magnetic field. The working electrician has quite enough to exasperate him at present without being driven absolutely mad by having to answer how many gausses his field magnets develop, how many watts his dynamo yields, what is the faradic capacity of his leads, what their conductivity in mhos, how many coulombs his accumulator holds, and other equally sensible inquiries. We wonder, with all their ingenuity, how it is that the classroom electricians have not found that a new unit of light duration is essential to their happiness. We suggest and respectfully dedicate to them that instead of the barbaric compound candle-hour or carcel-hour they should employ the term "Turpin," "Ketch," or "Calcraft," and so make an average representation of humanity among the names adopted for units."

Our contemporary is very severe and evidently very indignant. Another opinion on the subject is that of the Cleveland *Iron Trade Review*, which says:

We are moved to refer once more to this subject by the rapid augmentation of words which, because often times backed more by caprice than authority, must inevitably lead to great confusion. Here are a few of these terms of more recent genesis:

The erg.	The watt.	The metric horse-power.
The volt.	The henry.	The kilowatt.
The franklin.	The microfarad.	The megohm.
The dyne.	The ampère.	The ohm.
The force de cheval.	The centimetre-gramme-second.	

Some of these terms have, by general consent, taken their places as permanent additions to the language of technical science; others are more in the line of test or suggestion. We see in all of this the struggle of a new branch of practical science for definite expression, and as such we welcome these new terms, but "on trial only." Some of them are useless, other barbarous—all of them confusing until brought to the best authoritative definition. The great trouble is that so many of these terms are sprung upon the technical world by self-appointed authorities, who, because their pet words chance to be made use of occasionally by third parties, at once jump at the conclusion that a valuable addition has been made to the language. For instance, it is proposed to call the fellow that runs the electric motor a "Motoneer." The next thing, we will have "Gasetteer" for the man that runs the gas engine, "Keeleteer" for the manipulator of the Keely motor, and "Muleteer" for the engineer of the canal boat. Since we are in the midst of a rage for new words, it behooves all good citizens to invent one and then take to tall timber. The Fool-killer is on his rounds.

Postal Telegraph Bonds.

W. Brenton Welling says in his market letter regarding Postal Telegraph bonds that the authorized issue is $10,000,000. They were placed at 40, sold up to 50, down to 35, up to 69, where they stayed, gradually falling to 30, which is now bid for them, with few offered. They have always paid their interest, he says, but does not say what from. It was probably from the sale of securities. The stock of the company is $21,000,000. It sold first at $5, went down to $2.50, up to $8, and then back to $3, which is bid. Deducting what is locked up with the syndicate, what has been canceled by exchange for cable stock and what is not for sale at any price, the letter says there is very little Postal stock afloat. The same letter gives this information regarding Bankers' and Merchants' telegraph bonds: First mortgage 6s, total issue $290,000, covering only the division from New York to Washington, line costing over $600,000, bonds quoted nominally 50@80; general mortgage 6s, $10,000,000 authorized, probably nearly all issued, partly on contracts for wire mileage, partly sold and balance said to have been hypothecated, quoted 7¼@7¾. It has not been proved that these bonds are a first mortgage on any considerable telegraph mileage.

A New Theory on the "Hall Effect."

The writer suggests a very simple explanation for this famous "puzzle," which has exercised the scientific world for three or four years past. If we arrange a strip of metal through which a current of electricity is flowing, as shown by the arrows in Fig. 1, with the poles of a powerful electro-magnet above and below its centre, and then touch the galvanometer terminals 1 and 2 to the edges of the strip at the points *b* and *a*, exactly opposite, no current flows through the galvanometer *G*. But when the electro-magnet is energized by a strong current, a current is caused to flow through the galvanometer. Why?

Mr. Hall supposes that the equi-potential line *b a* has been rotated out of the vertical to the position *c d*, and that so long as the magnet acts the point *a* is at a higher potential than *b*, and the current through the galvanometer results from the flow from the higher to the lower potential. Without stating the various objections to this view, is it a

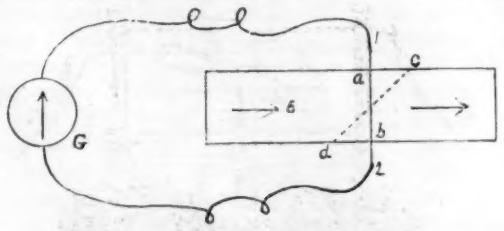


FIG. 1.

reasonable supposition? If we suppose it to be true that the point *a* is at a higher potential than *b* (the two points being exactly opposite to each other), we shall have a certain flow from *a* towards *b*. Will not this equalize the potential *in the strip itself?* It is certainly very easy to go from *a* to *b*, through a good conductor like gold. Is it not unreasonable to suppose that the equalization of potential will take place through the external circuit 1 *G* 2 at all, under the conditions stated? Moreover we have no reason, except the existence of a current through *G*, to suppose that there *is* any difference of potential between *b* and *a*. It is a forced explanation at best, and if we can satisfactorily account for this current by the action of

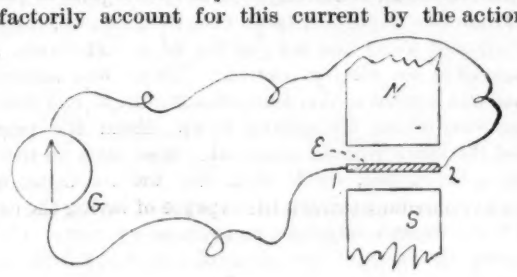


FIG. 2.

known and undisputed electrical laws, that explanation should prevail.

Mr. Shelford Bidwell supposes the phenomenon to be the effect of strain and thermal currents, while Prof. Sylvanus P. Thompson ascribes it to a change of the electrical resistance of the strip under the action of the powerful magnet, and Mr. W. H. Preece believes it to be due to contraction and dilation of the molecules of the strip under that action.

Now, may not this outside current be due to simple attraction and repulsion between the magnetic lines of force of the magnet and of the current through the strip? Let *N* and *S*, in Fig. 2, be the poles of the magnet, having the metal strip *e* between them (shown in cross section), with the galvanometer terminals, 1 and 2, touching its sides at

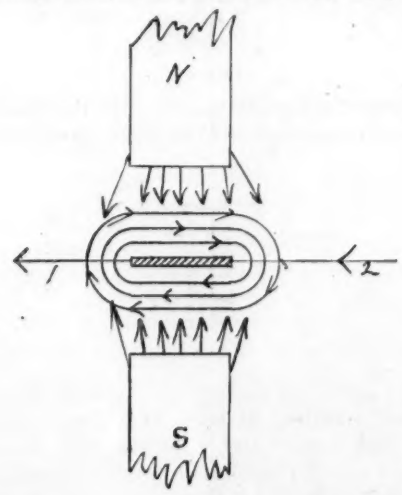


FIG. 3.

the equi-potential points *b* and *a*, as in Fig. 1. So long as the magnet is inert, no current flows through *G*, although a current is flowing through *e*. But when the magnet is energized a current flows, we will say, in the direction 1 *G* 2. Fig. 2 is merely a diagram of the apparatus.

In Fig. 3 we see the magnetic lines of force from the pole *N* to pole *S* (the middle portions being omitted for the sake of clearness), and also the magnetic "whorls" of the current flowing through the strip *e*, the direction of the lines of force being shown in each case by the arrow-heads; 1 and 2 are the terminals, touching *e*, and the arrows show the direction of the current in them. As the magnetic whorls of *e* come up at the left side (*m*) they are met, "head on," by the lines from pole *N*. The effect, as we all know, is repulsion, and the result is that a certain portion of the magnetic whorls or current is driven through 1 and around through the circuit 1 *G* 2. On the right side (*n*) the action is the reverse of that just described, or a drawing-in action through 2, and the result of both is the current through 1 *G* 2. To be sure, there are also influences acting in the reverse directions, but the resultant of all the magnetic actions is a minute current through the galvanometer as stated. When the terminals are removed from *b* and *a* to the points *c* and *d* (Fig. 1), the current stops, because the difference of potential at the latter points on the conductor *e* opposes and offsets the action of the magnet upon the current in *e*. The opposing influences being equal, there is no outside current. But if the magnet is removed, a current is at once observed flowing through the galvanometer, due to *d* being nearer the positive pole of the battery than *c*, and therefore at a higher potential. Thus we explain the whole phenomenon without the necessity of supposing that magnetism can produce a difference of electric potential between two exactly opposite points upon a narrow strip of gold, or other good conductor, through which a current is flowing.

Having sufficiently explained the principle, it will be unnecessary to take up your valuable space by applying this theory to all the possible changes in the conditions, as regards temperature, mode of clamping the strips, paramagnetic and diamagnetic metals, broad poles and narrow or pointed ones, etc., etc. That can easily be done by all who are familiar with the laws of magnetic attractions and repulsions, and they may judge for themselves whether this simple explanation will not account for all the observed results. The writer has from the first believed it to be the true one, but the eminence of the authorities in favor of the rotation theory has heretofore deterred him from offering it publicly. He now does so, asking for it such consideration as it may merit. F.

Bell Telephone Patents in Canada.

A dispatch of Nov. 21 from Ottawa says: A few weeks since the Toronto Telephone Manufacturing Company made application to the Dominion Government to have the patent of the Bell Telephone Company declared null and void for non-compliance with the patent law. The Bell Telephone Company then applied to the Chief Justice of Ontario for a writ of prohibition against the Minister of Agriculture on the ground that the provisions of the Patent act giving the Minister of Agriculture power to hear such cases was ultra vires of the Dominion constitution. The Chief Justice to-day declined to grant the writ, and the case will come up before the Minister on Monday next. The Dominion Patent act provides that a patent becomes null and void if the manufacture of the patented article is not commenced and continuously carried on in Canada within two years from the date of the patent in such a manner that any person desiring to use it may obtain it at reasonable price. The act further provides that if, after twelve months from the date of the patent, the patentee or his assignee imports or causes to be imported into Canada patented articles, his patent becomes void. Those who brought action against the Bell Telephone Company state that they can prove by invoice in the Customs Department that their telephones have been imported in violation of the act, and they have declined to sell their instruments.

A later dispatch, of Nov. 24, from Ottawa, says: The case of the Toronto Telephone Manufacturing Company against the Bell Telephone Company came up for hearing before the Minister of Agriculture to-day. This is the case in which the Toronto Company has applied to the Dominion government to set aside the Bell telephone patent and declare it void for an infraction of the Patent law. Every effort has been made by defendants to procure a writ preventing the Minister of Agriculture from hearing the case, on the ground that it was *ultra vires* of the Dominion constitution. They failed, and the case went on to-day. In opening, counsel for the prosecution brought documentary evidence to show that the larger number of telephones and essential component parts of the Bell telephone had been imported into Canada after the expiration of a year, as prescribed by statute; that after the expiration of two years the manufacturing of different parts of the instruments was carried on in the United States, these parts being imported and put together in Canada, in contravention of the Patent act, and that the Bell Telephone Company had refused to sell their instruments at any price. It was found, however, that several important witnesses had been unable to reach the city, and as the Minister of Agriculture desired to obtain all possible evidence he decided to adjourn the hearing until Tuesday, Dec. 2.

ELECTRICAL GAME CAPTURE.—The experience of some of the exposed electric lights in this country, in attracting winged inhabitants of the air is repeated and extended in foreign lands. The electric light has replaced oil lamps in the lighthouses at Planier (mouths of the Rhone), and quails by the dozen have been drawn to the brilliant illuminant. At Cape Ferret, in one night, the nine windows of the lighthouse there have all been broken to pieces by wild ducks and geese. In Brechut a wild goose broke and passed through the glass and fell into the lamp. In one night over one thousand quail were captured by the crew of an English lightship, and it was found necessary to protect the light by a strong grating.

Dynamo-Electric Machinery.

A lecture on dynamo-electric machinery was delivered by Prof. George Forbes, M. A., F. R. S. E., of England, at the International Electrical Exhibition, Philadelphia, under the auspices of the Franklin Institute, on Sept. 16. The lecture has been prepared for publication in the Journal of the Institute, and we have been favored with advance proofs. We give below the introductory portion of the lecture, being all we can find space for this week:

LECTURE.

The subject of this evening's lecture is dynamo-electric machinery, and it ought, perhaps, in greater strictness to be defined as dynamo-electric machinery in general, and not dynamo-electric machinery in particular, because in a single lecture it is impossible to go into the whole subject of the differences between various types of machines, and all I can hope to do in the course of this lecture is to give you a general insight into the theory and principles of construction of dynamo machinery and of the progress which has been made up to the present time in theoretical investigation and practical application.

At the beginning of this century our information about the action of electrical currents was extremely limited indeed, and it was not until a great discovery was made in the year 1820 that the basis was laid for those developments which have culminated in the vast number of machines which you see around you in this exhibition. At the commencement of the century, in fact up to quite a recent date, the current of electricity was developed, not by means of these machines which we see around us in the exhibition, but by means of a chemical apparatus which was called a voltaic battery, such a one as I hold in my hand here, which consists of two dissimilar metals, one of which is zinc and the other may be of carbon, copper or some other metal. When these two metals are dipped into a suitable acid and connected by a wire, a current of electricity is said to pass from the copper through that wire to the zinc. Now, if you ask me what is the current of electricity, I am bound to confess to you that I do not know. All that I can do is to give you some analogy to fix your mind upon while you are thinking

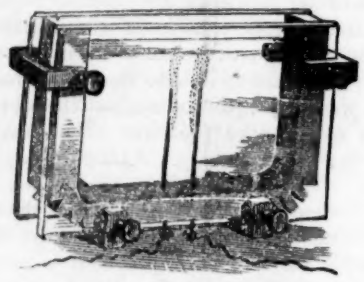


FIG. 1.

about a current of electricity. If I were to take a copper wire and hold one end of it in a hot flame and hold the other end in a block of ice, heat would be absorbed in the end which was in the flame and heat would be given out in the end which was in the ice, and heat would be conducted along the wire. No material substance is conducted along that wire, and I am sure there are very few of you that can form any conception of what is passing along in the wire. But you have a notion, not a physical conception of heat, and the phenomenon of heat transference through the wire is not unfamiliar to you. I do not say that electricity is the same as this, but it is the general opinion of scientific men that electricity passes through the wire in a somewhat similar manner to heat. It is energy and not matter which passes through the wire. That is not a tangible analogy.

I will try now to give you a clearer but grosser analogy. I allude to the analogy which exists between electricity and the flow of water in pipes. When we have a certain head or pressure of water we have also a flow of water through the pipes, and the greater the head or pressure the greater is the flow of water through the pipes. At the same time we have in the pipes a certain resistance to this flow, a resistance due to the small diameter of the pipe, and the smaller the diameter the greater the resistance to the flow of water. In all these points electricity has an analogue. We are able to get up what we call an electric pressure or electro-motive force which exactly corresponds to the pressure of the head of water. When we have this electro-motive force in the wire we are able to get a current of electricity through the wire, that is to say, a flow of electricity which is exactly analogous to the flow of water in the pipes. But this wire offers a resistance to the passage of electricity just as the pipe offered a resistance to the flow of water, and the larger the wire is, and the greater the sectional area, the greater is the flow of electricity, just as the greater the diameter of the pipe, the greater is the flow of water. Thus, I think you will admit that we have here a tangible analogy between the flow of water and the flow of electricity; and when I speak of the electro-motive force which we have, you will understand that it is analogous to the pressure of water, and when I speak of the resistance it is analogous to the frictional resistance to the flow of water in the pipe.

Previous to the year 1820 the important facts which were known in connection with the electric currents were these: First, that if two wires coming from a voltaic battery were dipped into a solution of acidulated water, the elements of which the water is composed were separated or decomposed and rose as bubbles to the surface. This experiment I can show you now by means of the magic lantern. We will lower the lights. We have now a cell which is exhibited on an enormous scale on this screen in an inverted position. (See Fig. 1.) Here is the top, and this is all air below; the cell being inverted the water which is contained in the cell is shown at the top of the picture; and here we have two wires; one is connected with the positive pole of the voltaic battery and the other with the negative pole. If now the wires be connected we shall see bubbles of gas, hydrogen and oxygen, rising to the surface. This shows a decomposition of the water in the cell in a manner such as it would be impossible for me to show you on the lecture table.

Another fact which was known at the same time, and which was one of the few important facts known, was this—that if a conductor, made thin enough, were brought

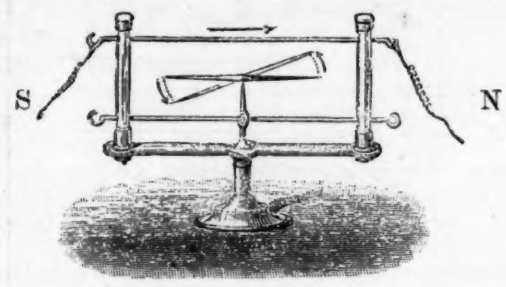


FIG. 2.

in connection with the two poles of the battery it would become red hot or white hot.

I have beneath this table a voltaic battery connected with two wires coming above the table. You will be able to see as soon as I connect them with a thin piece of platinum wire that the wire becomes hot, and if I diminish the resistance in the circuit by shortening the wire I can make it even hotter than that; I am able to make this wire of a bright red heat.

These two important facts were then known, the decomposition of water and the heating of a condenser, by the passage of an electric current. There was another fact that was known which I ought not omit to mention: The discovery of Sir Humphrey Davy, about the year 1811, that the spark which had so often been seen on the breaking of the circuit, could be intensified by using a large number of cells in a voltaic battery and taking the two ends of the wire and attaching to them two pieces of charcoal. On separating these two pieces of charcoal a brilliant light was seen to pass from one piece of the charcoal to the other. That is the fundamental experiment which led to the discovery of the electric light, that is, the arc light, which is so very much used in this country.

I have in the course of the last few years visited each one of the different electrical exhibitions which have been held in Europe. Last year I was at one held in Vienna. After I had wandered about the exhibition and visited the host of applications of electricity, rivalling in number those which you see in this Franklin Institute Exhibition, the

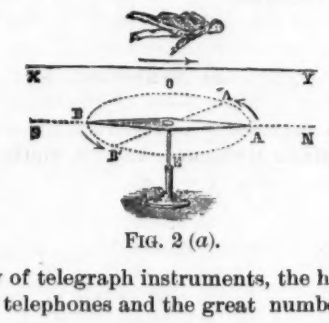


FIG. 2 (*a*).

great variety of telegraph instruments, the hosts of different kinds of telephones and the great number of types of

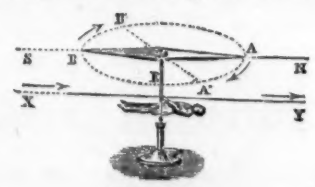


FIG. 2 (*b*).

dynamos distributed all over the building, I happened to find myself standing in front of a small exhibit which filled me with respect and a feeling akin to awe. This was a small object placed upon velvet and covered with a glass shade, and behind it there was a bust of the illustrious man who had used this apparatus. I looked upon this instrument with respect, because in the discovery made with it I saw the commencement and the dawn of the whole of that science of electricity which had reached such a culmination in the Vienna exhibition. I saw in that one experiment of that famous man the genesis of every one of the telegraph instruments in the exhibition, of every one of those telephones, of all the various applications of electricity, of every one of the types of dynamos in that building. I need hardly say to those acquainted with the history of electricity that I was looking at a small compass needle, and that the bust was that of the late Professor Oersted, of Copenhagen.

For many years people were aware that there was some hidden connection between the compass and electricity, between the power that impelled the compass to point to the north and the lightning in the sky. It had been believed that when lightning had disarranged the compass-needle and reversed its polarity it showed that there was some connection between electricity and magnetism, but no one could tell what that connection was. Mathematics were of no avail in the solution of this problem. Oersted happened to be experimenting with a battery and a compass and found the secret of the mystery, and it is from this point that we have to investigate the progress of electricity this evening.

Here we have a compass needle suspended under a wire. (See Fig. 2.) The wire will presently have an electric current passing through it. Oersted found that when the current coming from the copper pole passed over a compass needle from the south to the north, the compass needle moved with its north pole toward the west. That is, the compass needle was moved by the influence of the electric current, an action taking place between the current over it and itself. On this compass needle I have put some pieces of paper that you may be better able to see the experiments. If Mr. Knapp, who is kindly giving me his assistance, will now lower the plates into the battery you will immediately see a declination of the north pole of the compass to the west. On breaking the current the compass needle, as you see, immediately resumes its position from north to south. In other words, when the current is flowing in this direction, the north pole of the compass needle goes to your left. That is to say, if I be looking in the direction in which the current is going, the north pole of the compass needle seems to go round the wire in the direction of the hands of a watch. And if I had the compass needle at one side of the current the north pole would still tend to turn round in the direction of the hands of a watch; the south pole tend to go in the opposite direction. Another means has been proposed for indicating the direction of motion of the compass needle. If a man be supposed to be swimming in the direction of the current and facing the compass needle, he will see the north pole going to the left. In this way, looking at Fig. 2 (*a*) and Fig. 2 (*b*), we see that a current going from south to north, if above

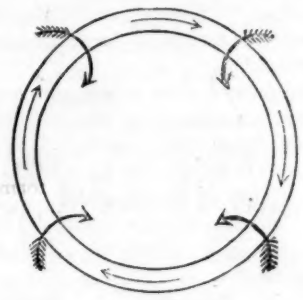


FIG. 3.

the compass, deflects it to the west of north, and if below, to the east of north. There are various results which we can see to follow from this principle. Here I have a rough ring to illustrate the direction in which the current is going (see Fig. 3). Let the light arrows show the direction of the current. Now, I have found, when I am looking along these, the north point appears to go round in the direction of the hands of a watch; so, also, looking at it from another point, the needle would still tend to go round in the direction of the hands of the watch, so that, wherever in front of this circle I may hold the north pole of the compass needle, it will always tend to go through the circle in that direction if the current is going in the direction of the arrows. Here we have a method of intensifying what was shown by Oersted. If I hold the compass in front of a coil the north pole will tend to be sucked in that direction, and the south pole would be sucked in in a similar manner if held at the other side of the coil.

(TO BE CONTINUED.)

Electric Lighting Consolidation in Canada.

When the contract for lighting certain streets in Toronto by electricity was awarded to the Toronto Electric Light Company, there was some local talk of one company buying out the other, and subsequently of an amalgamation of the two concerns. The Toronto Company were not ready to take over the routes that the Canada Company had lighted during the three months trial that took place previous to the awarding of the contract, and the latter company were requested by the city authorities to continue their lights for two months longer, so as to give the Toronto Company time to get in additional plant. At the expiration of this time, which was on Nov. 1, the Toronto Company was not ready to take over the routes maintained by the Canada Company, and proposals were made to amalgamate the two companies, which was this week finally decided on by the directors of the companies. The Toronto Company takes over all the plant of the Canada Company, and the new concern will carry on business under the style of the Toronto Electric Light Company. The following directors have been elected: Messrs. A. H. Campbell, President; E. S. Cox, Vice-President; Directors, John Leys (Rice Lewis & Son), S. Trees (S. Trees & Co.), H. P. Dwight, L. Bolster, D. M. McDonald, H. M. Pellatt, and D. Blain.

Electrical Congressses of the Past.

Now that we have brought to a close our full report of the proceedings of the National Conference of Electricians, it is interesting to compare the work there done and the manner of doing it, with the performances of the earlier Electrical Congresses. A good opportunity of doing this is afforded us by a little brochure by Mr. W. H. Preece, a copy of which has just reached us from the author. At the present time, we cannot do better than quote a portion of the clear and interesting narrative :

The year 1881 marks an epoch in the history of electricity. In that year the French government, with a liberality that fully justifies the praise bestowed upon them, contributed 300,000 francs for the purpose of holding a congress and instituting an electrical exhibition in Paris. The object of that Congress was said to be to codify electrical science and to sound its depths; and there is no doubt whatever that, in the conclusions to which that congress led, that wish has been thoroughly carried out.

In 1881, no less than 293 of the electricians and scientific men of this world met together in Paris. Of that number, France contributed 70, England 38, Belgium 32, Germany 15, and other countries in proportion. I think that amongst those who assembled there, there was scarcely one—if there be one—single shining light in the science of electricity found absent. There we had the brightest stars, and chief among them was our own Sir William Thomson. There we had Helmholtz, Clausius, Kirchoff, Wiedemann, Rowland (from America), Dumas, Lenz, Du Bois, Raymond, and every single man who has appeared for many years past at the head of papers that have been published in our scientific journals upon the progress of electricity. One of the most marked features of the 1881 Congress, and of the subsequent Congresses held in Paris, was the admirable organization with which the proceedings were conducted, chiefly attributable to the skill, decision and energy with which the President of each Congress—M. Cochery, the Minister of Posts and Telegraphs—conducted the proceedings. The Vice-Presidents were six in number, three foreign members and three French members. The Vice-Presidents on the foreign side were Sir William Thomson, Professor Helmholtz and Professor Govi; on the French side there were MM. Jules Ferry (the present Prime Minister of France), Sadi Carnot and the great Dumas, who has since, unfortunately, passed away. This Congress was divided into three distinct and well-marked sections. The first section was devoted entirely to the discussion of electrical units and the determination of their form. The second section was devoted to the consideration and discussion of questions that affected telegraphy, telephony and the application of electricity to railway purposes. The third section was rather more discursive in its character. It dealt with light in its various branches, with electro-physiology, with lightning, with the transmission of power, with clocks, with meteorology and with various other questions aside from telegraphy, and the more marked features of the practical applications of electricity.

The meetings were really divided into three classes also. We had first a meeting of the full conference, where the general subjects were discussed, and where the conclusions and resolutions arrived at by the sections were passed; secondly, we had sections to which different members attached themselves, and, thirdly, we had lectures given by a few of the members. The hours of meeting were so arranged that none of the sections ever clashed with each other, so that everybody had the opportunity of attending every meeting that was held.

The first meeting in Paris, in 1881, commenced on Sept. 15 and closed on Oct. 5. Eight full conferences were held, and a great many minor sectional meetings took place. * * * The result was certainly extremely beneficial.

Now, the first great result attained at this first Congress of 1881 was the acceptance of that magnificent system of units of measurement that will always last as a standing memorial to the honor of the British Association. The system of units known as the C. G. S. system, based upon the centimetre, the gramme, and the second, was accepted by the Congress at Paris, and by that means it became international as well as universal.

The second result was that the Congress defined what should be the ohm, defined and accepted the ampère, the coulomb and the farad; so that, with the smallest possible modification, it established that system of electrical units that is now familiar in our mouths as household words. But inasmuch as they could not accept and define without absolutely determining what these units were to be, it was decided that a future commission should be held in Paris, where the absolute determination of the ohm should be decided upon; where some system could also be decided upon by which we could secure regular observations on earth currents and atmospheric electricity, and also where it could affirm and determine some definite standard of light. The only material resolution not subsequently discussed that was decided at that first Congress was that a millimetre gauge should be used for determining the sizes of wires, which, I am sorry to say, owing to the very great obstruction that exists in England to the introduction of the metrical system, has not yet received any attention amongst us. Without coming to any definite conclusions or results, there were several subjects discussed and very fully discussed—for instance, electric lighting. Many meetings were held, where a battle royal took place between two, if not three, distinguished exponents in France for the transmission of power.

Again, we had discussions on the best arrangements for clocks and chronographs, and for the application of electricity for such purposes. Meteorology, medical electricity, and telephone working also occupied much attention; but the real fact was that we were too many on that occasion for real sound work, and, although much good was done, much remained to be done, and that which remained was done by the subsequent conferences.

A second and smaller congress, in October, 1882, was held in Paris. There were only forty-five members present, and of those forty-five we in England were only represented by one; but our one was a host in himself, and quite sufficient to represent us all, for our one on that occasion was again Sir William Thomson. At this second conference, again the divisions were three. At the first commission, as it was called, units were considered; at the second commission, atmospheric electricity and earth currents were discussed; and in the third commission the subject discussed was a proper standard of light. Again they had to part, without coming to definite decisions. Much work had been done; much knowledge was produced and described at that meeting; but they parted without any absolutely definite conclusion being come to, although the results deal very clearly with the points under discussion. But *the* grand point that this conference met to discuss was, in reality, what should be the ohm. It was found that only one observer had devoted very much time to this inquiry, and that was Lord Rayleigh; and although it was felt by every one that his results were so exact and his powers of observation so great that the utmost confidence could be felt in his figures, nevertheless it was thought that, before such a momentous question was decided as the length of the column of mercury representing the ohm, other observers should take up the question; and, as there were five distinct methods by which the ohm could be determined, it was agreed that the meeting should be postponed for another twelve months for further observations to be made.

Again, they passed resolutions that observations should be made on atmospheric electricity, on the behavior of lightning-conductors, on earth currents, and on the question of a standard of light. But, as I say, the definite conclusions were really left for the subsequent meeting that took place this year, when fifty of us met in Paris on April 28th, and were again marshalled, under the able presidency of M. Cochery, into the same three sections. We were received by the Prime Minister of France, who gave us a speech of considerable eloquence. But on this occasion we were more numerous in being represented, for we had there not only Sir William Thomson, but we had our President (Professor W. G. Adams), Professor Carey Foster, Mr. E. Graves, Professor Fleeming Jenkin, Professor Hughes, Captain Abney and myself.

I believe we did our work well. I believe that not only were the interests of English science and telegraph engineers well represented there, but I believe that, taking the Congress as a whole, the work was well done, the conclusions arrived at just, and the result must be nothing but beneficial to the workers in electrical science.

Enlightening Benighted Peru.

Last week there arrived in this city Mr. William Widlund and Mr. Macario Slaguno, and promptly upon them was let loose the interviewer of the New York *Herald*. The results of the inquisition are thus given in the columns of that paper :

"We have just come from Peru," said Mr. Widlund, "with the object of taking steps to provide the principal cities of that Republic with electric light. The government has granted us a concession for that purpose. It holds good for twenty years; applies to Lima, Callao, Piura, Cajamarca, Truxillo, Arequipa, Puno and Cuzco. According to the last census, that of 1876, the population of Lima is 101,488; of Callao, 33,582; of Piura, 6,811; of Cajamarca, 7,215; of Truxillo, 7,538; of Arequipa, 29,737; of Puno, 2,729, and of Cuzco, 18,370. Of these, Lima and Callao are the only two cities which are provided with gas. The others depend for light on kerosene lamps. In Lima there are 2,840 street lamps, and the cost of gas is $3.20 per thousand feet. Thus the annual expense of lighting the streets of Lima is about $80,000. Some years ago the price of gas was $7.20 per thousand feet, but that was due mainly to the depreciation of paper money at the time. In 1867, for instance, the difference in the value of gold and silver was from three to eight per cent. The same figures apply to Callao, in proportion to its population.

"On the 19th of last February the government granted a concession which enables us to give all these cities the advantages of electric light. The Prime Minister, Cestro Zaldivar, has approved of all our plans and attached his signature to all the necessary papers."

"Will not your undertaking require the outlay of many millions of dollars?"

"By no means. In the first place we are allowed to transport into the country free of duty all the apparatus necessary for our business, and in the second, we will not be obliged to use coal as a motive power, because both Lima and Callao are situated beside rivers, which are so graded as to be of inestimable benefit to us. Most of the articles imported into Peru have to pay an average duty of forty-five per cent., and even the gas company, which acquired its concessions some years ago, has to pay for every lamp it erects in the streets."

"Do you propose to use electric lights in the streets only?"

"Oh, no. Public buildings, stores and private houses will be supplied. Of course we cannot interfere with the present street lamps, but we will erect others beside them and let the public be the judge of their respective merits. In Arequipa and the cities which have no gas our task will be easy, especially as the inhabitants are very anxious to have some decent lights in their streets. You can understand that law-abiding men do not care to pass a lifetime in cities whose street lamps have to be filled with oil every night, and whose desperadoes, knowing right well that the nightly supply of kerosene will not burn more than a few hours, are apt to give a loose rein to their passions. Why, there are only 383 street lamps in Truxillo and only 800 in Arequipa. No gas company has been started in Arequipa and the other cities, because coal was too dear. It cost $16 a ton to bring it from the coast to Arequipa. Electric light can be generated without any such expense. The river Rimac, which cuts Lima in two and gives the city somewhat the appearance of New York and Brooklyn, is so admirably adapted for our purposes that we shall make our first experiments there.

What we propose to do, is, in the first place, to thoroughly examine the various modes of electric lighting, and, after we have made our choice, to intrust the carrying out of our scheme to a syndicate which will be composed of a limited number. Should we be unable to form a satisfactory syndicate, we shall form a company with a capital of $1,000,000, and invite the public to share in our profits. Should we fail in this direction my friend and I will work hand in hand without help from any one. One thing, however, is certain. Peru is utterly benighted in this one respect, and it is a scandal to civilization that cities with thousands of inhabitants should be left in almost utter darkness for twelve out of every twenty-four hours. What we can do to remedy the evil shall be done at once."

Mr. Widlund is a Swede by birth, and has been engaged in business in Lima for some years. He intends to remain here for two months, and will spend the time in examining the various modes of lighting streets and houses by electricity. Mr. Slaguno is a Peruvian by birth, and is a well known merchant of Lima. He returns to Peru on the next steamer.

An Electric Boiler Alarm.

Herr R. Schwartzkopff has devised an electric indicator which, fitted to a steam boiler, gives warning of insufficiency of water, excess of steam pressure, heating of the plates, and superheating of the water under normal pressure. The apparatus consists, according to the London *Electrician*, of concentric pipes, the inner of brass, open at top and closed at bottom, and reaching below the lowest water level, and the outer of iron, closed at top and open at bottom, the lower end corresponding with the lowest water level. The annular space between the two is placed in communication with a chamber at the top of the apparatus by a small spiral tube. When the water is at its normal level, and before being heated, it stands at the same height in the boiler and in the annular space; but as soon as the pressure increases, the water rises in the annular space until it reaches the chamber, freed from air by a small orifice, closed by a stop-cock. The column of water is maintained as long as there is sufficient pressure and the water level is above the normal, when the column becomes cooled by radiation, and the temperature of the chamber descends below boiling point. As soon as the water level falls below the normal, so as to uncover the orifice of the outer pipes, the column falls, and the steam rises into the annular space to the chamber, causing the temperature to rise above boiling point, and thus indicating a deficiency of water by means of an electric signal. In the inner pipe there are two copper wires, insulated from one another and connected with the poles of a battery. They are inclosed at top and bottom of the apparatus in brass boxes, the bottoms and covers of which are of an insulating substance. The upper box contains a ring of metal fusible at boiling point; and, as soon as there is a deficiency of water, the ring melts, and the first drops of metal are collected in a funnel-shaped receptacle, thus making contact between the wires, and causing bells to ring or signals to manifest themselves. The lower box, which is immersed in the water of the boiler, has the same temperature as that of the steam; and the ring is formed of an alloy so mixed as to melt at a temperature corresponding to whatever pressure may be fixed upon as the limit. In case the plates should heat, a signal is also given by the lower box, the ring of which melts through the heat radiated from the plates. A Leclanché battery is used to give the current; and it is said that the fusible rings may be replaced, after action, in ten minutes.

A SNUG CONTRACT.—Among the paper mills at Bellows Fall, Connecticut, the Swan Company has contracted for the introduction of about one thousand incandescent lamps.

The Distribution of Electrical Energy.

M. Gaulard, writing from the Turin Exhibiton on the 15th of October, sends the following communication to the editor of *La Lumière Electrique*: "In the number of *La Lumière Electrique* for October 11, you published a communication from Prof. Colombo on the experiments made at the Turin International Exhibition of Electricity by means of the secondary generators of Gaulard and Gibbs. This communication was preceded by an article in which M. Marcel Deprez seeks to show that the invention is not novel, that it has no scientific value, and that from an industrial point of view it is not patentable; and, in fine, that it is not susceptible of any useful application.

"Being directly concerned as the inventor of the system of the distribution of electric energy, which is the subject of this article, I think I may claim from your courtesy the insertion of the following rectification.

"In reply to the first point, I must remind M. Marcel Deprez that Prof. Colombo's communication contains literally the following sentence:—'These apparatus are composed in principle of two helices, formed very ingeniously of discs of copper superimposed on and insulated from each other, the discs or spirals of one helix comprising between them those of the other.'

"Now I do not believe that the earlier researches of M. Marcel Deprez, Sir C. Bright, and M. Jablochkoff, on the phenomena of induction effected by means of Ruhmkorff's coils, can be confounded with those undertaken by means of the instrument above described, and which differs from Ruhmkorff's coil, not merely in its form, but in the fundamental principle of its construction, which I have claimed a long time ago, and which consists in the absolute necessity of the equality of the inducing and induced masses, and the symmetry of their position with respect to the magnetic field, in order to obtain the maximum yield in the recovery of the transformed energy.

"Therefore, until M. Marcel Deprez shall have demonstrated that an apparatus similar in form and principle has been constructed by himself or by others, I shall consider myself as the inventor of a new arrangement, both from a scientific and an industrial point of view.

"As regards the novelty of the results, the controversies carried on to the present day on the yield of secondary generators prove that our predecessors have never even conceived the possibility of obtaining them.

"Measurements, which I consider as exact, have been taken at the Turin Exhibition by the members of the international jury by a method, the defence of which I leave to MM. Joubert and Mascart, since an instrument invented by the latter of these *savants* was used in these determinations.

"These measurements establish that the apparatus which we submitted to the examination of the jury furnish, when employed to produce the work for which they were constructed, a yield of 89 to 90 per cent. The apparatus measured by MM. Joubert and Pottier was represented by us as furnishing an electric work of 2-horse power, or 1,492 watts, under the influence of a primary current of 12 ampères. This apparatus, composed of 1,000 copper discs, of 12 centimetres external diameter, with a space of 5 centimetres in the centre, and of $\frac{1}{4}$ millimetre in thickness, forms a column of 15 centimetres in diameter, and 55 centimetres in height.

"The weight of the copper employed is 20 kilos, and the price consequently is 60 francs. M. Marcel Deprez has, therefore, misinterpreted the communication of Prof. Colombo, when he affirms that the mere price of the copper used in the construction of our apparatus amounts to 17 francs per Edison lamp, since with 60 francs' worth of copper we construct an apparatus capable of supplying 18 to 20 16-candle lamps. Thus, though M. Marcel Deprez pretends that it will be easy to find varied arrangements answering the same end, and which are certainly public property, I still doubt whether, in spite of his inventive genius, he will be able for a long time to find a more economic arrangement.

"There only remains the question whether our apparatus are capable of rendering industrial service. But all along, or at least since the learned researches of M. Marcel Deprez and his predecessors have given a powerful impulse to the utilization of the phenomena which electricity is capable of producing, the great concern of electricians has been to find industrial means of distributing electric energy. Without criticising here researches previously undertaken in this direction, we can say that no practical result has been secured in competition with that given by our secondary generator. I do not require to tell M. Marcel Deprez that one of the essential conditions for transmitting energy to a great distance is to give to the work transmitted the form of small quantity and high tension. But as, on the other hand, we do not know of any other instrument capable of utilizing industrially this form of energy, save the machine which he has promised to construct, we thought that it would be simpler, more logical, and consequently more useful, to search out the conditions of the industrial establishment of apparatus capable of transforming energy transmitted to a great distance, so as to render it utilizable by all apparatus lamps, and machines which modern industry has at its disposal.

"M. Marcel Deprez urges as an objection against us the necessity of employing for the working of our system for the distribution of energy, alternating current, which he pronounces dangerous. Not only is it possible for us to use currents of a uniform direction if they are interrupted or undulated, but we have good reasons for giving the preference to alternating currents. The first is that the principal circuit supplying all the secondary generators is closed metallically at the limits of the generator, whence it results that the points of the circuit which might be touched by consumers cannot have, at most, a difference of more than 100 volts, which is far from being formidable. On the other hand, I do not believe that the system of the transmission of energy by means of continuous currents, such as M. Marcel Deprez proposes to establish, offers a greater security. But the principal reason which leads us to adopt the alternative form for our primary currents is the simplicity with which great work may be obtained by means of known types of machines with alternating currents, whilst it seems to me very difficult, in default of proof to the contrary, to place, under dynamo machines with continuous currents, collectors capable of gathering great electromotive forces. Lastly, as to the independence of the apparatus it is absolute on our system. It is incorrect to say that the working of the lamps fed by our generators is compromised by the extinction of a single lamp, or of several, for the mobility of the magnetic field of our apparatus enables us, on the contrary, to vary at will the intensity of the current developed in their secondary circuit.

"As for the reproach urged against us that we can distribute merely light, if it were merited, still the fact of being able to utilize natural forces at distance for lighting up towns might satisfy the most impatient. But the difficulty signalized of producing an economic motor, by means of alternating currents, does not alarm us. If, for the production of motive power and for electro-chemical work, it is useful to have continuous currents, we shall effect on the secondary generators the same rectification of the current, as it has to be done with ordinary dynamos. It will be easy for us to supply to all kinds of machines the form of energy most suitable for their action, so that we have solved by the simplest method, not merely the question of the transmission of power to a distance, but the much more important problem of its distribution. But for the present we will simply claim the facts established, and for which our priority cannot be called in question.

"The experiments at Lanzo have taken place, not merely in presence of the jury, but have been repeated with complete success before the Italian Minister of Public Works and more than 300 Italian engineers and architects assembled at Turin by occasion of the fifth Congress.

"For five consecutive hours, the stations of Turin, Venario and Lanzo, connected with the gallery of the Exhibition by means of a circuit of 80 kilometres of chrome bronze wire, 3.7 millimetres in diameter, having a conductivity of 98 per cent., and courteously placed at our disposal by the firm Mouchel, have been lighted up as follows:

"The station of Turin with 34 16-candle Edison lamps, 48 8-candle lamps and 1 Siemens lamp; the station of Venario by two Siemens arc lamps; the station of Lanzo with nine Bernstein lamps, 16 Swan lamps of 100 volts, one sunlight and two Siemens arc lights. At the Exhibition there were burning nine Bernstein lamps, nine Swan lamps and one sun lamp, and in the Figaro kiosk, served by a small type secondary generator, five Swan lamps.

"In face of these results the jury awarded to MM. Gaulard and Gibbs the grand prize of 10,000 francs, given by the Italian government. In spite of our invitation of January last, M. Marcel Deprez had the kindness not to come and contest with us. Further, the fifth section of the Congress of Italian Engineers and Architects closed its works with the following order of the day:

"'The fifth section of the fifth Congress of Italian Engineers and Architects, assembled at Turin in 1884, cannot overlook the great importance of the experiments on the transmission of electric energy to great distances, conducted at Turin by means of the secondary generators of Gaulard and Gibbs, and having been able to appreciate the working of this system of distribution expresses the wish:

"'That government, municipal bodies and manufacturers may support the establishment of this system, and that the hopes may be realized which six months' experience on the metropolitan railway of London, the experiments at Turin-Lanzo, and the sound conceptions on which this system is based, have excited in the scientific and industrial world.'

"The sole conclusion to be drawn from these facts is that the distance from Paris to Turin is too great to permit M. Marcel Deprez to judge the case with a full knowledge of the circumstances. But the illumination of the stations on the railway Torino-Cirié-Lanzo will be continued until the close of the Exhibition, and the quarantine being now suppressed, the difficulty in the way of a full examination by those interested is considerably diminished.

"However this may be, it is with a legitimate satisfaction that in the midst of the wonderful signs of the development of Italian industry, of which Turin is at present the theatre, I have kept the flag of France at the head of the progress realized by the applications of science to industry."

The Storm and the Wires.

The wind blew great guns all over the Northern and some of the Southern States on Sunday night last, and kept it up next day. Generally throughout the country the blow of Sunday night was accompanied by a heavy rainfall.

A wind blowing at a rate faster than 25 miles an hour is considered a dangerous wind; and when on Sunday night it reached a velocity in this city of 36 miles an hour, managers of telegraph and telephone companies rested uneasily. They knew that it meant wires down, wires broken and wires swinging together, broken circuits, communication shut off, and expense. The Baltimore & Ohio Telegraph Company was the promptest to act. At 7:30 Sunday evening an engine was sent up the West Shore road, carrying several linemen and their tools. There were washouts at Marlborough and Tompkins Cove, which carried away the poles of the company. These were promptly repaired. At no time was communication entirely cut off from any point on the company's lines, though in places one or more wires had to be discontinued.

"It was a very severe storm," said Mr. E. A. Leslie, the Superintendent of the company, "and I was surprised that our lines stood it so well. They are all new, and the admirable way in which they are constructed accounts for it. Monday morning we had the only wire to Boston from the Stock Exchange. Our men were out at daylight, and by noon all breaks were closed. That afternoon we had some trouble west of Cleveland, but communication was not cut off."

"How was the Manhattan district service affected?"

"Only one circuit was in trouble. That was quickly remedied."

The Bankers & Merchants' Telegraph Company, which embraces the American Rapid Postal and Southern companies, and has 200 line wires here, seems to have suffered most by the storm—at least it acknowledged serious trouble. While there were breaks both East and West, it was in the East that things first came to a standstill. At 10 o'clock Sunday night the 40 Eastern wires of the company were worthless. Of the 16 remaining West, a third could not be worked. Thousands of words of press matter for Boston and the East were refused, and all branch offices east of New Haven were notified of indefinite delays.

"Trees were blown across our wires," said the Superintendent, "poles blown down, and where there was slack enough to let the wires swing together, communication was interrupted hopelessly. We kept up communication with the West Sunday night, but from the East we were shut off. Monday we worked a few wires unreliably, but by dark had things in fair shape. The Western Union would take none of our matter."

The Bankers and Merchants put into use what is known as the "rapid system," and which is known to be advantageous only in such emergencies as that of Sunday, where two or three wires only can be worked. By the Morse system an average of 40 words a minute is sent. By the rapid system 1,000 words a minute can be transmitted. But the time required to prepare the tape and then translate the message at the other end more than overbalances the time required by the Morse system. The company cleared up a fair amount of business late in the afternoon. In the Connecticut Valley the most damage was done. The city wires of the company were badly mixed on Monday morning, but were soon in shape, a large force of linemen being employed.

"It was an awful storm," remarked the Western Union Superintendent, "and Sunday night we were in bad shape. The trouble was chiefly up the Central road and in the East. Within 33 miles of New York we had little trouble in any direction. Out of that circuit the storm seems to have been more severe. We kept one wire working to Boston, so that cable communication was at no time cut off. It was Sunday night, you see, and business was light. Any other night, and business would have accumulated. We've had little trouble in New Jersey and the West. It was in the Connecticut Valley that we were pretty well laid out."

The telephone companies reported 200 crosses on Monday morning, and half a dozen broken wires. At 11 A. M. everything was running as usual, though crosses often occurred during the afternoon. The lines are now working fairly well.

The Franklin Institute Prizes for Children.

Professor Vogdes, of the Central High School, Philadelphia, has about completed the examination of the essays prepared by the pupils of the public schools on the Electrical Exhibition. The Franklin Institute prizes and the prizes given by THE ELECTRICAL WORLD will be awarded at once. The mementoes consist of bright new $5 gold pieces of this year's coinage, resting in square leather cases lined with blue velvet and satin. On the top of the lid the seal of the Franklin Institute is stamped in gilt letters. Besides the $5 gold piece, the recipients of the prizes will also receive the engraved diploma, with signatures of the judges and stamped with the seal of the Institute. One prizes will be awarded to each boy's grammar school in each section, and one to each girl's grammar school in each section. In addition, a prize will be awarded to each of the eight classes in the Boy's High School and one to each of the eight sections in the Girls' Normal School.

Mr. Edison's Views and Work.

We take from the Boston *Herald* the subjoined interview of Mr. Edison by its New York correspondent:

NEW YORK, Nov. 22, 1884.—Thomas Alva Edison, the inventor, will not complete his 38th year until next February. He has grown somewhat stouter in recent years, but his face is still clean shaven and his brown hair cut short. A pair of large gray eyes, remarkable for the great size of their pupils, looked from beneath a black Derby hat as he received a reporter to-day.

"What progress are you making in the production of electricity direct from coal?" was the inquiry which opened the conversation.

"I am searching for a line upon which to work," was the reply. "I reached a point some time ago where a difficulty of a very serious character seemed to obstruct further progress, but I have not abandoned the task. Some one will some time solve the problem, I have no doubt, and I know of no subject more worthy of my attention. How long I shall work at it I have no idea, but years of labor would be richly rewarded by a discovery of so vast importance."

"You do not think it necessary to wait until electricity can be produced directly from coal, before railways can be operated by that force, do you?"

"I satisfied myself long ago that electricity can be substituted for steam on railways, and the change can be made immediately with great advantage to the owners of railway property. The elevated railways of this city furnish the most favorable conditions for the introduction of electric motive power, and there can be no doubt among experts that the new system would be much less expensive than that at present in use. It would not take me ten days to have my motor ready to work on the Second avenue line of the Manhattan Company, and the only question as to the time for the proposed test of the rival motors is concerning the laying of the third rail from Chatham Square to the Harlem River. I perceived the feasibleness of the application of electricity as motive power on railways before I turned my attention to the telephone and to the electric light, but the practical development of my idea was deferred."

"Of course you did not mean all railways, when you said that electricity can be substituted for steam as motive power, without waiting for the solution of the problem of the production of electricity directly from coal?"

"Yes, I did."

"Do you really assert that the heavy freight and passenger trains of the New York Central & Hudson River Railway could now be moved by electricity more economically than by steam power?"

"I do."

"Why is not the change made then? The railway managers of the country are a very keen class of men, and are likely to adopt anything which can increase their dividends."

"But great corporations move slowly, and a change of such magnitude cannot be effected in a day. Railway men lack my confidence in the success of what I suggest, and they will have to be convinced by experiments like that which is now proposed on the elevated railways. I cannot say, however, that I expect to see the freight and passenger trains of the whole country moved by electric motors until after some one discovers how to produce electricity directly from coal."

"Do you believe that electricity can be substituted for horse power and for the cable system on surface railways in cities?"

"The conditions of such railways are much less favorable for the change than those of the lines of the Manhattan Company. The mud and slush and sinking of the streets in spots might cause trouble."

"How about the danger of contact with the rails of an electric street railway?"

"The electric current would flow over an underground conductor, and two copper rods of the size of the wire rope of one of the cable street-car lines would be suitable for the purpose. The obstruction of the crevice through which connection would be made between the motor and the rods would not be more troublesome than that of the cable system at present in successful operation. However, I have not given much thought to the substitution of electricity for horses on surface street cars."

"What do you say as to the danger of electricity on the lines of the Manhattan company?"

"I think that an electromotive force of 800 volts would put a man in the hospital, but I agree with Mr. Field, the electrician of the Commercial Telegram Company, that the maximum force required to operate the elevated trains will not make death the result of contact with the track. I shall not fear harm from anything less than 800 volts. The number of employés would be greatly reduced by the substitution of electricity for steam. Only one man would be required on each motor and the number of repairers could be greatly reduced. The explosive action of steam power is very depreciating, and the wear upon the tracks and structure of the Manhattan Company would be greatly reduced by the substitution of a motive power acting continuously and smoothly. Instead of several hundred firemen on little locomotives, the company would have a few firemen at one great station for the production of steam to move the dynamos for the generation of electricity for a whole line, and the system could be conducted upon scientific methods and with the utmost economy. Coal dust could be used to a great extent instead of the costly grades of coal now purchased by the company and necessarily used in a locomotive. The great sugar refiners now use coal-dust exclusively for their great engines. There are no greater consumers of power in New York than the sugar works. The mechanism of the electric motor is very simple, and the cost would be much less than that of the locomotives now in use, especially when the comparative durability and expenditures for repairs are taken into the consideration. The motors could be made very light were it not necessary to give them sufficient traction to draw trains filled with people. They must be heavy enough so that their wheels will not slip on the rails. I wish especially to emphasize the importance, both to the owners of the elevated railways and to the public, of the provision of elevators to carry passengers back and forth from the street to the platforms where they take the trains (continued the great electrician). The same current which moves the trains would move the elevators, so that the expense of operating them would be trifling, and I am confident that they would increase the traffic of the Manhattan Company not less than 25 per cent. during the hours when aged people and ladies are out. My attention has been particularly directed to this matter, because my wife, who was an invalid for some years, never rode on the elevated railways. She had not the strength to climb the long stairways, and I believe that a multitude of people in feeble health would be benefited by the erection of elevators at all the stations of the Manhattan Railway. People who wish to make short trips would then ride in the elevated trains, and the short-trip traffic would greatly increase."

The International Inventions Exhibition, London.

In the editorial columns of THE ELECTRICAL WORLD two weeks since we referred to the International Inventions Exhibition, to be held in London, commencing in May, 1885, at the Royal Horticultural Gardens, South Kensington, and remaining open until the end of the year. We stated then that, even at that early date, the applications for admission and space numbered 4,000. Applicants for space will take notice that all foreign applications for this exhibition must be filled out and mailed so as to be in London by the 31st day of December, 1884. This requires their leaving here as early as the 15th or 20th of December at the very latest.

The exhibition will consist of two grand divisions, each of which will be divided into groups and classes. The first division, devoted to inventions, will embrace apparatus, appliances, processes and products invented or brought into use since 1862, when the great World's Fair was held in the Crystal Palace. The object of this collection is to show the progress that has ben made during the last quarter of a century in the application of scientific discoveries to the purposes of daily life. There is ample field for the display of American ingenuity, as exhibits will not be limited to important mechanical appliances and the utilization of natural products, but will also include Yankee notions of all descriptions.

The second division will be devoted to music in all its branches, chiefly musical instruments invented since the beginning of the present century. Historic collections of musical instruments, and of pictures representing musical subjects will form an incidental feature of this exhibit. Medals in gold, silver and bronze, and diplomas of honor will be awarded.

This exhibition is under the patronage of Her Majesty the Queen, and the president is the Prince of Wales. The executive council contains some of the most eminent scientists and others in England.

Blank forms for such application, together with detailed information for the guidance of exhibitors, will be forwarded free to all persons applying to Mr. J. Pierrepont Edwards, British Consul, No. 27 State street, New York.

No charge will be made for space. The Commissioner to be appointed by the President of the United States will represent the interests of American exhibitors.

To give more than a general outline of the intents and scope of the Exhibition and arrangements for exhibitors would require far more space than we can afford; we therefore cull from the official documents forwarded us all that relates to electrical science and the workers therein.

Under ELECTRICITY. Group XIII., Division I., are noted: *Generators*—Dynamos, primary and secondary batteries, thermo-electric batteries. *Conductors*—Submarine cables and apparatus for laying them, aerial wires and underground cables, insulators and poles, insulating and coating materials, joints and connections, underground conduits, pipes, tubes, troughs, &c., electric light leads. *Testing and Measuring Apparatus*:—Galvanometers, magnetometers, dynamometers, volt-meters, current-meters, methods of testing. *Telegraphic and Telephonic Apparatus*—Needle, A B C and Morse instruments, type-printers, relays, duplex and quadruplex apparatus, keys, recording instruments, automatic transmitters, electric bells, indicators, telephones, microphones, lightning protectors. *Electric Lighting Apparatus*—Lamps, resistance coils, cut-outs, safety catches, switches, fittings for glow and other lamps. *Electro-Metallurgy and Electro-Chemistry*—Methods of depositing and coating various metals, electrotyping, galvano-plasty, vats, cleaning and polishing apparatus, materials, tools and appliances. *Distribution and Utilization of Power*—Electric railways, motors and electrically-driven boats, tricycles and other conveyances, systems of distribution. *Electric Signaling*—Fire and burglar alarms, railway, ship and time signals, water-level and wind indicators, tell-tales, electric clocks, chronoscopes, etc. *Lightning Conductors, Electro-Medical Apparatus, Electrolytic Methods for Extracting and Purifying Metals*—Copper, zinc, lead, iron, refining the precious metals. *Electro-Thermic Apparatus*—Electrical apparatus for war, mining, blasting, and other purposes. *Tests and Photometrical Apparatus*—Chemical tests, standards and measurements of light. *Scientific Apparatus used in Electrical Research*—Friction and induction machines, batteries, and other sources of electricity, Leyden jars, condensers, eleotroscopes, electrometers, galvanometers, voltameters, dynamometers, magnetometers, rheostats, resistances, electrical units, induction coils, thermopiles, vacuum tubes.

There is no class of men living who have more cause for legitimate pride in their attainments and the benefits bestowed upon mankind than the electricians of the United States, and we trust that as they are acknowledged leaders in all that relates to the application or adaptation of electricity to practical industries and the wants of the community, no pains will be spared to convince the world, through the display at the Inventions Exhibition, that the scientists of the United States still retain their proud supremacy.

The Boston Electrical Exhibition.

The American Electrical Exhibition, which will be held in Boston, Mass., next month, has, for an Advisory Board, the following named gentlemen: His Honor Mayor Martin, ex-Mayor Dr. Samuel A. Green, ex-Gov. Alexander H. Rice, Eben D. Jordan, Hon. P. A. Collins, Col. Charles H. Taylor, J. M. Rodocanachi, Arthur G. Tompkins, F. A. Searle and E. Burt Phillips. To this board the general manager, Mr. P. H. Alexander, has submitted his first report, of which the following is an abstract: In submitting to your honorable board a report of the work done on the American Electrical Exhibition up to this date, the management regrets to be compelled to state that, owing to the delay in removing the goods of the late Mechanics' Fair from the building to be occupied, the opening day of the electrical exhibition will have to be deferred until Dec. 1. Although rapid progress is made in arranging matters in the building, it was thought best to open the electrical exhibition in a more complete state than has of late been usual with enterprises of this kind. The management prides itself in having obtained not only a large number of exhibitors, but displays of inventions in the electric line of unusual interest. It is the object of showing the application and adaptability of electricity to many industries, and while some matters shown will not yet be adopted in practice, yet they will show the possibilities and probabilities of the application of electrical science in the near future. The management trusts it will fulfill the promise made some time ago to make this exhibition complete and comprehensive in every particular, and can confidently say that it will exceed in novelty any that has ever been held in New England. Quite a number of lighting companies have applied for space and are arranging their exhibits. The Edison, the United States, the Consolidated, the Ball, the Sun, the Domestic and the White companies will show incandescent lighting, the first lights produced by dynamo machines, the two last by electric batteries. Three more firms in that branch have applied for space. The New England, Weston, the Arago, the Ball, the Whitney, the Whitehouse-Mills and the Enos companies have, up to date, arranged for a display of arc lights. Several telephone companies will lay their claim for the superiority of their special inventions before the public, the American Bell company intending to have a telephone exchange in the building, and even giving the public an opportunity to speak by wire to New York, thus showing that distance has ceased to be a drawback to telephonic communication. It is intended to show the progress in telegraphy from the oldest Morse system in progressive stages to Delano's Synchronous Multiplex. The Anglo-American Telegraph Company have kindly consented to show a Thomson's reflecting galvanometer (connected up to a short circuit), and a section of the transatlantic cable, and visitors to the exhibition will have an opportunity, never before offered to the public, of seeing the transmitting and receiving of cable messages. The exhibit will be in charge of competent operators. The application of electricity as a motive power has become a matter of great interest of late, and the management, has taken especial pains to show its application in various ways. Several working models of existing electric railways will be shown; among others the famous Giant's Causeway Railroad of Ireland, a railway that has been in successful operation now for two years. The Bidwell Electric Railroad will run a train composed of two little palace cars, each seating from 16 to 20 people, around the balcony of the exhibition hall, on a track about 600 feet in length. The same current that propels the cars will also light them with incandescent lamps, and the avenue hrough which they travel, with arc lights. Quite a large amount

of space is devoted to the various systems of fire alarms, burglar alarms, police, telegraphs and railway signals. Hotel annunciators, electric bells, clock regulators and electric clocks, as well as electric toys, will make this department extremely attractive. An electric water meter, an invention entirely new, is also to be displayed.

The musical world will be interested in the application of electricity to musical instruments, such as organs and pianos. Another very interesting electrical piano has been entered by G. Delano of Boston. Organ music can be played upon the same by the vibration of hammers set in motion by electrical batteries. Theatre-goers will certainly go and see the Little Bijou Theatre shown at the exhibition building. The same is to be a reproduction on a smaller scale of the Bijou Theatre on Washington street, which was the first theatre in America lighted by electricity. Mr. Edison will supply the miniature electric lamps, while the Bell Telephone Company intend to connect this small play-house with the Bijou Theatre on Washington street, and, by placing above the stage of the latter several microphone transmitters, will give the visitor to the exhibition building an opportunity to listen to the melodies of the opera played at the theatre. The farmers and poultry raisers will doubtless view with astonishment the application of electricity to the artificial hatching of chickens. Two companies—the Perfect Hatcher Company of Ilion, and the Eclipse Incubator Company, of Waltham—will rival each other in the display of such apparatus. The branches necessary to the production of electricity will be represented by a number of styles of steam engines, copper, steel and iron wire, glass globes for arc lamps, metals, carbons, rubber and other materials used in connection therewith; they will be shown in great variety, and will doubtless attract many who make the electrical science a special study. As the management desires to make this exhibition educational in its character, they have provided themselves with a great deal of experimental apparatus, and engaged the services of lecturers well versed in this science. It is intended to invite the schools of Boston and of the surrounding cities and towns to visit the exhibition. A special lecture on electricity will be given to the children in the lecture hall before admitting them to the exhibition hall proper, so they may enter the latter with a better understanding for the articles shown there, and, under the guidance of their teachers, see in practical operation the many matters taught them in their institutions of learning. In closing this report, the management wishes to express its confidence in the interest taken by the exhibitors themselves in not delaying work, and hopes to be able to show the exhibition to the public on the opening day in a complete state.

Contracts for Telephonic Territory.

The suit between the Newark (N. J.) Domestic Telegraph and Telephone Company, complainant, and the Metropolitan Telephone and Telegraph Company and the New York and New Jersey Telephone Company, defendants, was decided adversely to the complainant, by Vice-Chancellor Van Fleet a few days ago.

The case is one that attracts peculiar attention, and is of interest to many, for the reason that many parties are now holding limited licenses from the Bell Telephone Company, who imagine that, upon certain conditions, it is optional with them to renew such licenses upon their expiration.

In this suit the matter may be thus briefly stated: The complainant leased from the Bell Telephone Co., of New York, the right to establish that system within the city of Newark, N. J. The contract enumerated the various rights and pledges of each party, to do, and not to do, this or that, for a term of five years, embracing from the 1st day of September, 1879, to the last day of August, 1884.

The entire trouble hinged upon the eleventh paragraph of the contract, which is as follows:

"If, at the expiration of the above period of five years, the party of the first part shall not desire to conduct the business of telephonic district exchange directly within said district of the party of the second part, or of merging said district into some other district, but shall, on the contrary, desire to have such business conducted for it, then and in such case the party of the second part shall have the first right of acquiring the license, or agency, to conduct such business at such rate or rental and upon such terms as may then be fixed and determined by the party of the first part."

On July 1, the Bell Co., of New York, sold its lines and business and all rights, including those of complainant, to the Metropolitan Telephone and Telegraph Co., and in this sale the Newark Co. assented to such transfer and has since recognized the M. T. & T. Co. as the regular successor standing in the place of the Bell Co., and invested with all the rights owned by the original organization and bound by every concession granted in the contract.

When in April, 1884, the Newark Co. applied to the M. T. & T. Co for a renewal of its licence. Its application was refused and it then made application to compel the M. T. & T. Co. to specifically perform the contract of Aug. 6, 1879, by granting to the complainant a new license "upon such terms as may be decided by the court" and asking that pending the litigation, an injunction be issued restraining the defendant from doing diverse things or interfering in any way with the complainant's business.

We have given, verbatim, the clause in the contract upon which the Newark Co. claimed the right to renew. Our readers can form their own opinions in regard to the controversy, but in an elaborate, extended, and, as is usual in legal matters, verbose opinion, Van Fleet, V. C., gives the law on't, and the pith of such decision or opinion as delivered may be given thus:

"The contract does not contain an unconditional covenant of renewal, or indeed, a covenant to renew at all."

The covenant simply is that "it shall have a first or preferential right to a new license. This, it is plain, is not a covenant to renew."

And this statement, repeated and reiterated and twisted and turned, in every vagary of legal conglomeration, forms the opinion (that would cover a page of THE ELECTRICAL WORLD), and upon this the decision is based which places the defendants in possession of the rights, property, privileges, and territory of the complainant, and the New York and New Jersey Telephone Company took possession and commenced business in Newark on Nov. 17.

From this decision of the V. C. the dispossessed company has naturally appealed, and is determined to carry the matter to the highest courts in the endeavor to sustain its view of the matter.

The whole proceedings only serve to illustrate the fact that the way an interested party may look at, consider and understand a contract will sometimes be very far from the admissible way and "the law on't."

The Newark *Advertiser*, of Nov. 19th, says in regard to the above:

The case of the Domestic Telegraph & Telephone Company and the New Jersey & New York (or Metropolitan) Telephone Company was taken before the Court of Errors and Appeals yesterday, and the Court to-day granted a stay of proceedings until the end of the next term. When the Vice-Chancellor, a few days ago, dismissed the order to show cause, and thereby enabled the Metropolitan Company to proceed with its work of establishing a competitive line, the Domestic Company's counsel, Messrs. McCarter, Hubbell and Young, immediately applied to the Court of Errors and Appeals for a hearing on appeal. The preliminary argument took place yesterday, and this morning the Court granted a stay of proceedings, putting down the case for argument next term, so that the decision will not be announced before April next.

This leaves the Domestic Company in possession of the telephone field in this city pending the decision, at least, and gives them the opportunity of a full hearing before the Court, when counsel hope to secure a different construction of the contract between the Bell Company and the Domestic Company from that given by the Vice-Chancellor, who held that the Domestic was not entitled to an extension of the contract.

The New York company has been active in erecting lines and preparing for business since the Vice-Chancellor's decision, and has taken possession of quarters in the Firemen's Insurance Building. The right of the compeny to erect poles and wires in the city will, it is understood, be contested.

The Commercial Advance of the Edison System.

The report of the trustees of the Edison Electric Light Company for the year ended Sept. 30 is in print, and says the past year has been an important one in the way of progress, and especially in the readjustment of relations which had grown out of the past. One item of consequence was the arrangement made with the Isolated Company, regarding exploiting work, whereby the annual expenses of the Edison company are reduced from about $100,000 to $25,000, exclusive of unusual legal or other expenses. The Edison company has a proprietary interest of 51 per cent. in the capital of the Isolated company. The profits of the latter were $35,000 the first six months of 1884, and are estimated the same to Dec. 31, making $70,000 for the year, which is equal to nearly 10 per cent. on the stock. This amount is needed to make up the company's deficit. There is greater promise of income from local and licensed lighting companies. There are 18 of these companies having central stations, three being in Massachusetts, at Brockton, Lawrence and Fall River. The licensed company in New York earned a profit of $10,429.46 in the first quarter of 1884, a profit of $7,251.57 the second quarter, $3,873.46 the third quarter, and an estimated profit for the fourth quarter of $9,600. The net loss in 1883 was $4,457.50. The capital of the New York company is $1,000,000, and its capacity 13,000 lamps. The Brockton company earned $6,634.19 during the fiscal year, which was $380.29 less than the expenses. Its capital is $100,000, and it has 2,090 lamps, with capacity for 3,200. Statistics of the Lawrence company are deficient, but it appears to have increased its lamps from 1,461 to 2,440, to have earned nearly $1,100 in September, with expenses $700 to $800. The treasurer says he is confident of making 4 per cent. the last six months of 1884. The capital is $65,000 and capacity 3,200 lamps. The capital of the Edison parent company is unchanged, being $1,080,000, of which $553,517.60 is paid for in cash, $347,450 is assured to T. A. Edison for patents, leaving $179,033 in the treasury due Mr. Edison, etc. The balance sheet shows the book debits and credits to be $1,720,346.32. The credits, consisting of $900,967.60 capital stock paid in, $761,108.14 in licenses from sub-companies, $43,654.92 dividends and royalties collected and $14,615.66 in accounts payable. The stock of the Edison company is now 40 bid, 75 asked.

Combination of Motor Interests.

An important step, anticipated by us last week, was taken on the evening of the 25th, toward the practical consolidation of the interests represented by the several electric motors. Nearly a score of gentlemen interested in electrical inventions and improvements met in the house of E. N. Dickerson, Jr., No. 64 East Thirty-fourth street, and resolved to form a company for the purpose of combining the usefulness of the various electric motors now in existence. The following-named gentlemen attended the meeting: Cyrus W. Field, David Dudley Field, Stephen D. Field, and Henry M. Field, representing the Field motor; C. H. Coster, of Drexel, Morgan & Co., representing the Edison motor; the Messrs. Hawkesworth, representing the Daft motor; Rowland R. Hazard, representing the Brush motor, and Charles Hoeltzer, representing the Siemens motor; E. N. Dickerson, E. N. Dickerson, Jr., and Col. Frank Hain, General Manager of the Manhattan Railway system.

The idea of bringing the five different electric motors under the control of one organization was practically agreed upon at a meeting held at Mr. Dickerson's residence on Nov. 18, and the action on the 25th was therefore a ratification of what had been done before. It was resolved that the new company should have a capital stock of $1,000,000, one-half to be paid in cash and the other half to be apportioned among the owners of the five different motors, according to their ascertained relative values. The representatives of these motors agreed last night to submit the question of relative values to a commission to be composed of the following gentlemen: Prof. Sir William Thomson, of Glasgow; George B. Roberts, president of the Pennsylvania Railroad; James H. Rutter, president of the New York Central; Robert Harris, president of the Northern Pacific Railroad, and Charles R. Cross, Professor of Physics in the Massachusetts Institute of Technology, at Boston. This commission will be asked to investigate the merits of each of the five motors named and grade them according to their practical worth. The avowed intention of the new company is to get not only the best motor, but also to utilize the best features of the different motors. Mr. Field said that it was hoped that the commission would render a decision within the next three months.

"To What Base Uses."

There is a rule in all well conducted telephone exchanges that when a subscriber, or any other man, is found swearing through the wire, promising his wife "Hail Columbia!" if dinner is not on time when he gets home, or otherwise abusing the facilities science affords him for abuse of somebody else at safe from kicking or hair pulling distance, that subscriber is shut off at once, But there is little protection against the voice of the swindler, and so the telephone has been abused and become the accomplice of a sharper. William J. Brown was lately discharged from the employment of Alexander & Ellis, whose lumber yard is at Washington and Flushing avenues, Brooklyn. He thirsted for revenge and revenue, and with a genius that deserves and will probably receive its reward (a term in the penitentiary) he telephonically ordered, from his former employers, in the name of a customer, 900 feet of lumber. He then proceeded to intercept the truckman who was bringing the lumber, and representing himself as the son of the buyer, he had the load dumped on a vacant lot and sent the cartman off with a receipt; then, securing another truck, carted off and sold his plunder. Brown then enlarged his field of operations, and worked his new idea and the telephone for all they were worth. When bills were presented for the goods delivered, the fraud and new victims were discovered. Detectives called Brown and switched him on to Justice Walsh's legal circuit. He now has a chance to study the reverse course of a current from wire to cell, and the Telephone Exchange will hear his winning voice no more.

The Electric Light at Racine, Wis.

The Racine Electric Light and Power Co. have filed articles of incorporation with the Secretary of State at Madison. Mr. S. S. Badger, of Chicago, is president; the other officers are Racine men. The capital stock is $50,000. The plant proposed and upon which contractors are now at work will cost about $30,000. The company already have about six miles of line constructed, also a brick building 50 by 70 feet for boilers, engines and offices. The work is all of a very substantial nature. Two of the admirable Payne 50 horse-power automatic engines are being put in. The City Council have ordered six lights placed on as many cross streets as an experiment, and if satisfactory a large portion of the city will be so lighted. No masts or towers will be erected.

The company will take immediate steps to illuminate the best houses in the residence portion of the city by an incandescent circuit, a sufficient number of patrons having already been secured to warrant the step. The Thomson-Houston system will be used throughout.

It Must Not Be Motoneer.

To the Editor of The Electrical World:

SIR: I am sorry to break my resolution not to intrude upon your valuable space, but when I saw that hybrid, spectral "motoneer" rise before my imagination I resolved, at any cost, to speak in protestation and supplication, and say "Don't," or, as Macbeth puts it, "Take any other form but that, and my firm nerves shall never tremble." I think that all electricians should hasten to file their protest against this counterfeit before it has gained a circulation and taken root, like so many other misnomers with which the science is already afflicted. Mr. T. D. Lockwood's dissertation in your issue of Nov. 22 makes a good heading to this petition against barbarisms, with its pointed and well-directed shots. Indeed, the only thing in it which could have been improved was the attempted pun on "moutons," which would have made Rabelais protest in his turn, even though that luminary of science, philosophy *and so forth*, was not particularly careful with his words himself.

As for "motoneer" it is evidently an attempt to evolve a term which will be the analogue of "engineer." But that attempt itself can only result in adding one blunder to another, as will be seen on inquiry into the legitimate meaning of that term. The word engineer was originally intended to define exclusively, "A person skilled in the principles and practice of engineering, either civil, military, mechanical, marine," etc. According to this definition the man who designs or builds an engine is an engineer. This definition is retained so far as I know in all European languages. In America, however (and I believe nowhere else), the meaning of the term has been extended so as to make it apply as well to the person who drives or manages an engine. Indeed to many persons in this country the word engineer possesses no higher meaning than the latter. It is probably the persistent and extensive use of the term in this sense that has brought its recognition in the dictionary. In England the terms "engine-man" and "engine-driver"—both good dictionary words—seem to be used altogether. The word engineer is apparently restricted to its original meaning. Certainly, much ambiguity and confusion would be avoided in this country if such were the case also.

It is not necessary, then, that we should adhere to the termination "eer" in the term intended to designate a person who manages a motor. The man who manages the switches seems perfectly satisfied to be called a "switchman;" the man who manages the brakes is content to be called a "brakeman;" the man who manages the boilers does not object to being called a "fireman," and the correct term for one who manages an engine is "engineman." Pray, then, why not stop inventing new words and adopt "*motorman*." This word is just as easy as any to pronounce. It is short, and to the point. It speaks for itself. No one needs to refer to a dictionary to learn what it means. It is, indeed, a perfectly legitimate word, with a long line of pure Saxon ancestry—tradesman, workman, footman, etc.—and a full line of relations, sisters, cousins and aunts, like cabman, hackman, boatman, etc.

NEW YORK, Nov. 24, 1884. AMPERE.

The Pan Electric in Texas.

To the Editor of The Electrical World:

SIR: I find upon investigation that the Pan Electric Telephone Company really have a line running along a narrow-gauge railroad up in North Texas, of the existence of which—towns, railroad and lines—I was ignorant. I have never browsed around much on the edge of the Staked Plain. If the discovery of this line was reported in the newspapers, it escaped my attention. But this fact does not relieve Mr. Watkins from the charge of misinforming the electrical public. A line should not be called "lines." The Pan Electric Exchange is not yet in operation at Fort Worth, and they have not other lines and exchanges now constructing in this State.

I agree with the gentleman that "the signal success which the Pan Electric Telephone Company has met with during the past six months is a significant fact as to its future status." Nothing can be more obvious. I didn't expect such an admission. A legitimate enterprise would soon succumb to a like "signal success."

Forgive me for occupying so much of your space with such an unimportant matter. G. W. FOSTER.

GALVESTON, Tex., Nov. 20.

The Lumley Dynamo-Electric Machine.

To the Editor of The Electrical World:

SIR: In your issue of Nov. 8th I notice an article headed "The Kind of Plant Wanted." Permit me to say that the so-called Phœnix dynamo made by Patterson & Cooper, of London, England, is no other than the Lumley machine which this concern (P. & C.) contracted with the patentees to make on a royalty, and finding that it was a cheap and good machine, made some mechanical change in it in order to get out of the payment of the royalty. Action has been commenced against them for the breach of contract, which will terminate in a few days by their being stopped in the manufacture of these machines. The Lumley dynamo will shortly be placed on this market, when your readers will have a chance to examine the machine and judge its merits.

ONE OF THE PATENTEES OF THE LUMLEY DYNAMO.

NEW YO[illegible]

THE TELEGRAPH.

CABLING EDITORIALS.—The gossips have it that James Gordon Bennett proposes, when his ocean cables are in working order, to dictate his editorials over it from London to the *Herald*. Why not? The only trouble is he will not be able to read them "in proof."

A GOOD GERMAN IDEA.—By an order of the German Postmaster General it is now allowable to deposit telegrams in letter boxes, especially in the boxes attached to the mail cars on rail, way trains. It is only necessary to write the message on paper, mark it "telegram," and attach postage stamps sufficient for payment, or the message can be sent partially stamped, or entirely unpaid, the sender being held responsible if the party receiving it will not pay. This facility only holds good at this time to the German Empire, exclusive of Bavaria, Wurtemberg and foreign countries.

PHENOMENAL WEATHER.—In the Northwest, on range with Milwaukee, Wis., on Saturday night last the mercury fell 50°; from 40° above zero to 3° below; from 8 P. M. Saturday to 5 A. M. Monday, saw a painfully rapid drop. In the northern part of Wisconsin there was snow several feet deep. At Minnedosa, Manitoba, on the 23d inst., the mercury crouched in the tube of 31° below zero mark. On Monday, 6 A. M., the temperature at Duluth was 14° below. The cold rode upon the wings of a fierce gale, which made its intensity more severe. The damage to property, grain and shipping has been very extensive. Telegraph lines were blown down in all directions and communication for a time greatly interfered with or suspended at many points.

A N. Y. C. STATION CREMATED.—At 1 o'clock P. M. of the 21st inst., the New York Central station building in Batavia, N. Y., caught fire in the ticket and telegraph office. The fire department, owing to defective water power were unable to render any material assistance, and in 45 minutes the building was in ruins. It was built three years ago, and the Railroad Commissioners pronounced it the best station on the line of the road. It was of brick, 90 feet long and 30 feet wide, with a long covered platform at each end. All the tickets, books of records, and about $100 in money, and all the telegraph instruments were consumed. In the baggage room were fifteen pieces of baggage, mostly belonging to private individuals, and only six pieces were removed. It is supposed that the fire originated from an explosion of coal gas in a stove in the office. The loss is estimated at about $10,000, and according to the custom of the railroad company there is no insurance.

FRAUD CHARGED.—As a judgment creditor of the insolvent banking and brokerage firm of A. W. Dimock & Co., late of the Bankers and Merchants' Telegraph Company, Henry A. Wheeler recently began a suit in the Supreme Court to have the assignment made by that firm to George Putnam Smith, in May last, set aside as fraudulent. He alleges that the assignment was not really meant for the benefit of creditors, but on its face showed that it was intended to hinder and delay them in the collection of their claims, and he points out that the personal creditors of the members of the insolvent firm are preferred and ordered to be paid out of the copartnership assets before the claims of the large creditors of the firm are considered. This preference of personal creditors over the firm's creditors and provision for their benefit out of money on which they have no real claim, the plaintiff alleges, make the deed of assignment invalid. Several days ago his counsel moved for the appointment of a Receiver of the property of the firm. No appearance was made on the other side, and his motion was granted by default. Subsequently the lawyers on both sides met and agreed that Assignee Smith should continue to collect the assets of the firm, but should not pay out any money until ordered to do so by the court. An order to this effect was made by Judge Barrett, in Supreme Court Chambers.

THE TELEPHONE.

A LONG CHAT.—The *Democratic Press*, of La Salle, O., says: Perhaps the longest telephone circuit ever made from La Salle was made last Sunday by Manager Enyart. It extended from La Salle to Elkhart, Ind., *via.* Ottawa, Morris, Joliet, Chicago, Ill., and Michigan City, Laporte, and South Bend, Ind., to Elkhart, a distance of 290 miles. Over this long line a voice could readily be recognized.

A "MOST WISE JUDGE."—The referee to whom was referred the suit brought in May last, by the city of Philadelphia against the Bell Telephone Co, and the Mutual Union and Western Union Telegraph Co., to recover a license fee of $1.00 per year for each pole and $2.50 per mile of wire, filed his report a few days since, deciding in favor of the defendants. He says that the fees exacted are unreasonable and operate in substance as a tax, and he therefore is of opinion that their collection cannot be enforced.

ANOTHER EXTENDED CONVERSATION.—A late number of the Charleston (S. C.) *News and Courier* says: An interesting trial of the powers of the telephone was made at the office of the Southern Bell Telephone Company in this city yesterday afternoon. The telephone wire was connected with the telegraph wire from here to Jacksonville, Fla., and after the connection was made Messrs. John D. Easterling, W. B. Roods and D. I. Carson, the General Superintendent of the company, who were in Jacksonville, and Messrs. D. M O'Driscoll, the Manager of the Southern Telegraph Company, and E. L. Caldwell, the Manager of the Telephone Company in Charleston, carried on a lively and interesting conversation. Afterwards the office here was connected with the one in Savannah, and a conversation was carried on with Mr. Henry J. Valleau, the manager at that place. The trial was in every respect successful, the voices of the parties in Savannah and Jacksonville being plainly recognized.

THE ELECTRIC LIGHT.

A NEW E. L. CO. IN MASS.—With Mr. Stephen Saulsbury as President, and Mr. Charles B. Whiting, Treasurer, the Electric Light and Illuminating Company, of Worcester, Mass., has been organized under the laws of that State, with a paid up capital of $100,000. The plant will provide for 4,000 ten-candle power lights, though only 3,500 of these will be used at the start.

AN ENGLISH ADVERTISING IDEA.—In London a pretty little brougham, brilliantly lighted by electricity, is driven along the streets. An incandescent lamp hangs behind the carriage, another adorns the horse's head, a third is attached to the driver's hat, and on the back is the name and address of the advertiser, who thus brings his business before the public in an effective manner.

THE ENGLISH ADMIRALTY AND THE LIGHT.—In a late test trial at Portsmouth, England, by order of the Admiralty authorities, to prove the relative values of oil and electric mast and signal lights on vessels, a 50-candle Edison lamp so far distanced the standard oil signal-light that competition or comparison was abandoned. It was found that the oil light was equal to only one-half the power of a 16-candle electric lamp, and the light of the latter could be seen through a haze when the oil lamp had entirely disappeared.

THE E. L. IN ST. LOUIS.—From the West there is a constant succession of notices giving evidence of continued adoption of the electric light. In St. Louis the mammoth Exposition Building, where is now being held a fair by the Women's Christian Association and a national convention of cattle men, an Armington-Sims engine furnishes power for 800 and more Edison lights; the new broom factory of the Samuel Cupples Woodenware Co., takes 150 incandescent lamps of 16 candle-power each, and the Weston lights, just put into operation in the new Post Office, are working to the perfect satisfaction of all concerned.

GAS VERSUS ELECTRICITY.—Is electricity to supersede gas altogether? By no means, replies *Chambers' Journal*, for gas is destined to play a more important part in the future than it has done in the past. Following close upon the revolution in the production of heat for purposes of warming and cooking, and for the production of power, gas in the future will be largely used not necessarily as an illuminant, but as a fuel and a power producer. When gas is burned in an ordinary gas flame, 95 per cent. of the gas is consumed in producing heat, and the remaining 5 per cent. only in producing light. Gas is far more efficient than raw coal as a heating agent; and it is also far cheaper to turn coal into gas and use the gas in a gas engine than to burn the coal directly under the boiler of a steam engine; for gas engines are far more economical than steam engines. Bearing these facts in mind, it cannot but be seen that the time is not far distant when, both by rich and poor, gas will be used as the cheapest, most cleanly and most convenient means for heating and cooking, and raw coal need not enter our houses; also that gas engines must sooner or later supersede steam engines, and gas thus be used for driving the machine that produces electricity.

APPLICATIONS OF POWER.

A SUCCESSFUL ELECTRIC ROAD.—The electric railway 6,695 metres (about 4⅛ miles) long and of 39 inches gauge, which connects the cities of Frankfort and Offenbach, leads from the old "Romerbrocke," Frankfort, through Sachenhausen, Oberrand, and covers the entire distance in about 25 minutes.

AN ELECTRIC TORPEDO COMPANY.—In the County Clerk's office of New York, a few day ago, was filed the certificate incorporating the Sims Electric Torpedo Co., which has a stock of $1,000,000, and is to manufacture torpedo, war ships, etc. The incorporators are Richard C. McCormick, Oscar Marshall and Henry P. Butler.

THE RENARD-KREBS BALOON.—The news comes from London that Capts. Renard and Krebs made on Nov. 10, a third trial of their navigable balloon. According to the statements of eye witnesses, the experiment was completely successful. Shortly after mid-day the balloon ascended slowly from the works at Meudon. It proceeded over the Meudon Railway station to a point above Billancourt, where it stopped for a minute, and then veering round, sailed with a perfect regularity of motion over the Meudon Valley back to the starting point. The voyage lasted three-quarters of an hour.

ELECTRIC MOTORS ON THE BRIDGE.—The Daft Electric Light and Power Company have obtained permission to experiment on the bridge with their electric motors, and they are now preparing their dynamos. The Bridge trustees have given the company permission to experiment on the bridge between the hours of 1 and 5 A. M., stipulating that they (the trustees) shall be at no expense. This is an experiment on the part of the company. The trustees are merely spectators, and have made no promises to adopt the system in case of its proving successful. The motor will pick up the electricity by means of a contact wheel gliding over the central track, which, however, will not be exactly central, but sufficiently to one side to avoid the sheaves carrying the cable. The electricity put into this nearly central track will be from dynamos situated on the Brooklyn side. The current will be of great power, but low tension, so that it will be perfectly harmless. The dynamos on their part will be worked by a large stationary engine. The company claim that they can save the elevated roads 50 per cent. of what they are now spending.

MISCELLANEOUS NOTES.

ELECTRICITY AND REACTION.—In reactions taking place under the influence of acids, the rapidity of such reaction, so states Ostwald, is proportional to the electric conductivity of the acids. The same fact was previously essentially determined by Svante Arrhenius, but Ostwald knew nothing of the prior discovery.

A PARIS ELECTRIC BELL(E).—The reigning queen of fashion in Paris does not disdain to shine by borrowed brilliancy and electric art is enlisted to enhance the charms of nature. The lady is the young Marquise de Belbeuf, a charming creature with a decided taste for the bizarre and eccentric in dress. It is her fancy to enter a ball-room crowned with a wreath of autumn blossoms, not too bright in colors, and with a bouquet of similar flowers in her corsage. Presently she touches a secret spring and both wreath and bouquet are brilliant with electric light.

"COPPERING" THE CHOLERA.—A certain M. Deligny, who controls some 40,000 operatives in copper mining throughout the province of Huelva in Spain, and where his experience as chief

engineer of that industry has been continuous since 1848, states that during this long period he has never known or heard of any one connected with the mines dying of cholera; deaths from zymotic diseases are rare amongst them, and the general health of the miners is excellent. In the present cholera "scare" people of rank and wealth from large cities of Spain have engaged every available lodging in the copper mining districts. He also asserts that during the cholera visitation in Sweden, in 1864-65, the immunity of the copper producing section was so noted that the royal family and court went to live in the Phalun mines, and not a single death occurred there during the epidemic. How to produce the atmospheric effect of a copper mine in case the scourge reaches our shores is a question that should receive due attention from our scientists and electricians.

An Interesting Experiment.—In the *Comptes Rendus*, O. Decharme gives the following: If we expose a plate of copper to the flame of a spirit-lamp or of a Bunsen burner, or, better, to the fixed and narrow jet of an enameler's lamp, there are produced upon the metal iridescent coronæ around the heated point. If the experiment is well managed there are obtained fixed colored rings, apparently unalterable, in the air. These thermic rings are quite similar to the electro-chemical rings of Nobili; like them they follow one upon another, and are propagated in waves. In both cases the colors succeed each other in the same order, which is that of Newton's rings as seen by transmission. Multiple thermic rings may be produced by means of drums surmounted by two, three, four, etc., gas burners. These same pieces serve equally for the production of the electro-chemical rings by fixing in the fine openings of the tubes needles of steel of equal length for each system. The thermic rings, simple or multiple, approximate the more closely to the corresponding electro-chemical rings as the jets of flame are feebler and less oxidizing.

Electric Guardianship.—"The inventive genius of man,' says the Newark *Advertiser*, "has been largely devoted to the protection of dwellings against burglars, and electric mats and guarded windows send information to the police, sometimes in advance of any knowledge of the owner that he has been visited by unwelcome guests. Formerly bolts and bars, thick walls and iron shutters were relied on, but now banks and other business establishments rely more upon a plate-glass window, a gas-burner, and an electric wire than they do upon all the devices that oppose iron and stone to brute strength. But invention never comes to an end, and the last novelty is somewhat bewildering. It is a new protection against fire, the ordinary thermometer being utilized to give the alarm. This is done by the attachment of an electrical apparatus so adjusted that any unusual heat in a room will affect the thermometer and cause it to ring a bell and so to give the alarm. It is suggested very properly that this device can also be used to warn the occupants of rooms when they are enduring a heat injurious to health. There are too many people who stifle themselves, entirely unaware that they are violating the laws of health, and it is the case also in school-rooms and places of public resort. One of the theatres in this city is often almost unendurable from the combined heat and bad air, and if a note of warning could be sounded it would be a charity. These little things show how electricity is yet to be applied for the comfort of the race."

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Stock Exchange, the Boston Exchange, and elsewhere are as follows:

Telegraph.—Am. Cable, b 49½; B. & M., b 2, a 4½; Mutual Union, b 12, a 14; Western Union, b 60⅝, a 60¾.

The receivers of the Bankers and Merchants' Telegraph Company are reported to have issued certificates in payment for 700 miles of new wire lately put up.

Telephone.—Am. Bell, b 191, a 192; Erie, b 18, a 19; Mexican, b 1½; New England, b 31.

There is good demand for both Bell and New England stocks. The New England will probably not make the advance in rentals this year which was at one time contemplated.

Electric Light.—No sales quoted.

BUSINESS NOTICES.

The Jarvis Engineering Company.—There are no signs of hard times or slack work about No. 61 Oliver street, Boston, where the Jarvis Co. do a general steam business and make a specialty of setting boilers with the Jarvis Patent Furnace. Business is and has been continually brisk at this establishment, and within a very short period recently they have furnished most of the electric light stations in New England with Armington & Sims engines, and the Jarvis Boiler Furnace, the last plant supplied being that for the Edison Electric Light Co. of Brockton, Mass. This company supplied an Armington & Sims 750 H. P. engine and seven Jarvis furnaces for the Brush Electric Light Co. of Boston, and an A. & S. engine for the Financial TelegramCo. of the same city; two A. & S. engines for the United States Illuminating Co.; one boiler for the Edison Co. in the National Theatre, New York; one boiler for the Royal Electric Co., Montreal, Canada; one boiler for the Lewistown, Me., Electric Light Co., and a number for firms, companies and others not connected with electrical affairs (which we have alone mentioned), in all sections of North and South America, Canada, Cuba and the Sandwich Islands.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

Edited by EDWARD P. THOMPSON, M. E., Electrical Expert, 9 Murray Street, New York.

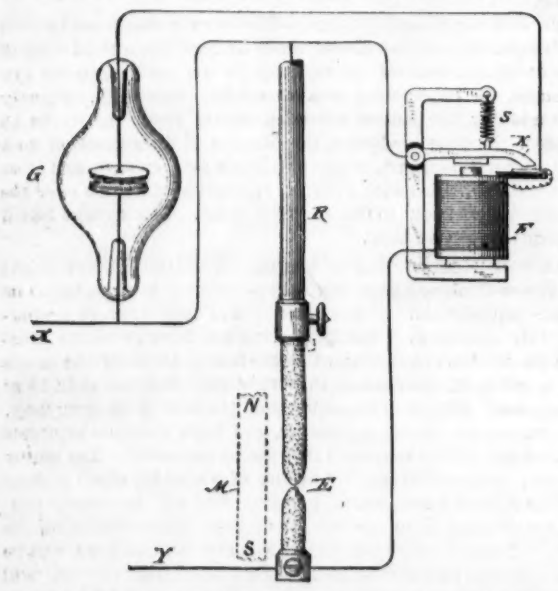
PATENTS DATED NOV. 11, 1884.

Anti-Induction Device for Telephonic Circuits; H. Van Hoevenbergh, Elizabeth, N. J..... 308,019
Consists of a condenser which is so organized that the line-currents are forced to traverse the entire length of one of the condenser-plates instead of acting merely to electrically charge the same.

Apparatus for Maintaining Electrical Connections; C. W. Williams, Cave City, Ky., G. S. Barnum, Atlanta, Ga., and E. B. Ives, of New York, N. Y..... 307,888
Consists in the employment of semi-elliptical springs making electrical contact with the wire by pressure or sliding contact.

Apparatus for Operating Tools by Electricity; C. J. Van Depoele, Chicago, Ill..... 307,884
Consists of a solenoid, an electro-magnet as a core, suitable electrical connections to cause one of said instruments to give motion to the other, and a tool operated by the motion of the moving instrument.

Automatic Cut-Out for Electric Apparatus; E. Thomson, Lynn, Mass., Assignor to the Thomson-Houston Electric Co., Conn..... 307,818
A long arc at *E*, from failure to feed, finally results in the establishment of a leak through the vacuous space in *G*, thus energizing the magnet *F*, and shunting the arc and also *G* at *K*, after which the carbons at *E* remain cut out. Should contact again be formed at *E*, the magnet *F* is shunted thereby, and releases its armature and opens the contacts at *K*.



Battery; W. S. Hogg, U. S. Navy..... 307,945
Consists of an electrode of zinc in a solution of sulphate of zinc, and an electrode of lead in dilute sulphuric acid.

Combined Electro, Vapor and Warm Air Bath; J. B. Campbell, Cincinnati, O..... 307,745
Consists of a casing in which sits the patient, and which is made of zinc having overlapping edges and flexible covering with aperture for the neck. A current of electricity passes from the head to the feet.

Combined Gas and Electric Light Fixture; L. Steiringer, New York, N. Y..... 307,879
The electric lamp arms only extend to the ornamental body or ring of the fixture.

Communicating to and from Moving Vessels by Electricity; L. J. Phelps, New York, N. Y.... 307,984
Consists of a system based upon the principle that electric currents may be produced by electric induction without actual contact.

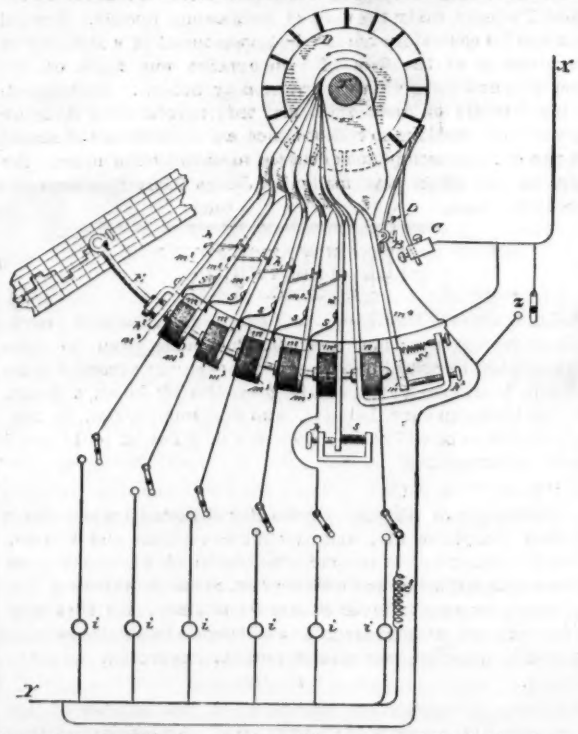
Cut-Out for Electric Arc Lamps; E. Thomson, Lynn, Mass., Assignor to Thomson-Houston Electric Co., Conn..... 307,819
Consists of a short or shunt circuit-closer, of a magnet in the carbon-circuit for keeping the circuit-closer open, and means, whereby the arc may be displaced through the influence of a magnetic field.

Electric Arc Lamp; E. J. Houston, Philadelphia, Pa., Assignor to the Thomson-Houston Electric Co., of Conn..... 307,769
Consists of a frame for the carbon holder, and is made of side bars and a lower cross piece adjustably uniting said side bars.

Electric Arc Lamp; A. Serrillier, London, England, Assignor of 2-3 to C. E. Ball, Philadelphia, Pa 307,808
The tripping device comprises a conically bored holder, in which are inserted a set of balls which are maintained in contact with the carbon by reason of their gravity or equivalent.

Electric Cigar Lighter; W. Glass, New York, N. Y., Assignor to S. Bergman and E. H. Johnson, both of same place..... 307,759
A yielding switch closes whenever the torch, which is suspended by wires, is lifted for use; the current that heats an exposed wire to incandescence.

Apparatus for Regulating and Distributing Electric Currents; J. J. Skinner, Newtonville, Mass..... 307,810
The closing of any circuit will energize a magnet *m* and close the armature of that magnet, and by means of the hooks *h*, rod *E*, and its connections, *N* will be pushed forward on the commutator far enough to give the right current.



Electric Magnet; W. A. Legge, New York, N. Y.. 307,777
Consists in first corrugating metal ribbon, then winding the same on edge, and then compressing the coils together.

Electro-Magnetic Annunciator; A. C. Palmer, Utica, N. Y..... 307,866
Consists of an electro-magnet, an armature and plate pivoted to the supporting-frame, and a blind pivoted to said armature and plate.

Electrical Conductor for Railways; A. M. Nesper, Pittsburg, Pa..... 307,791
Consists of a longitudinally-slotted trough or case having lateral rail supports provided with standards, insulated conductors secured to said standards, traveler-rails, and a traveler having a laterally-projecting frame provided with spring-conductors adapted to engage with the insulated conductors of the trough.

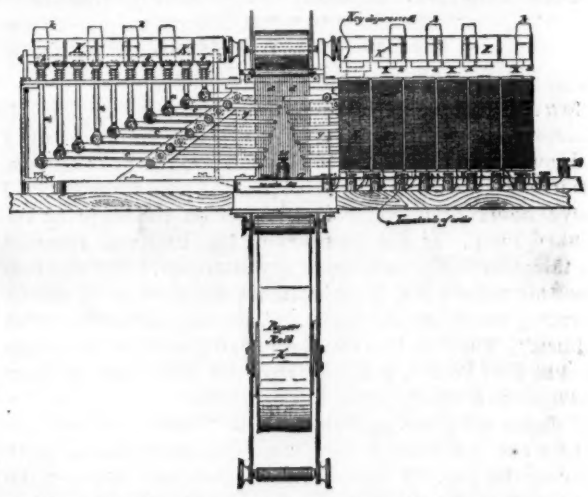
Electrophorus for Igniting Gas; C. W. Weiss, Brooklyn, N. Y., Assignor to the Weiss Mfg. Co., of same place..... 307,823
The metallic plate has a frictional surface of lead or lead alloy for the resinous plate to impinge against.

Insulator; J. S. Cleveland and G. F. Kent, Norridgewock, Me. 307,916
Comprises two insulator-blocks adapted at their meeting ends to clamp the wire, combined with the means for clamping the said blocks together.

Mechanical Telephone; Mr. Randolph, New York, N. Y., Assignor to the Universal Telephone Co., of same place..... 307,800
The line-wire is connected with the diaphragm by numerous short diverging wires.

Railroad Signal System; W. Hadden, Brooklyn, N. Y., and H. Van Hoevenbergh, Elizabeth, N. J., said Van Hoevenbergh Assignor to said Hadden.....307,760
Consists in interrupters and signal-magnets, whereby the entrance of the train at one end of the block sets in operation the interrupter, which allows the banner to fall, and continues to act automatically until the train passes from the other end of the block, when the continuity of the current is re-established, and the signal banners indicate that the track is clear.

Printing Telegraph; G. A. Cassagnes, Paris, France..... 307,841
Consists of a series of keys carrying series of armatures with their electro-magnets and with the levers of a type-writing machine for putting marks on paper, and means for feeding the paper, all arranged so that each key, when depressed, will actuate the type-writer and at the same time close a local circuit. Figure gives in elevation two views of the machine. On the left-hand side the electro-magnets and electrical connections are supposed to be removed, so as to show the internal mechanism. On the right-hand side are shown the electro-magnets *E E E* acting on the keys *K K k k* through their armatures *X X X x x x*. Binding post 10 is fixed on the two mains which are connected with the cores of the electro-magnets *E E E*. Binding-post 18 is fixed on the two mains which are connected with one extremity of the coils of the electro-magnets *E E E*.



Signal Box; H. McGonegal, and S. D. Lake, Brooklyn, N. Y.....308,036
Consist of a transmitting-wheel having a number of equi-distant indentations and one or more groups of indentations formed on its periphery, a spring adapted to move said wheel, a crank adapted to move said wheel in the opposite direction and to simultaneously wind said spring, and a dial having different service-designating characters formed thereon, by causing said crank to indicate any one of which characters a signal will be transmitted through the reverse movement of said transmitting-wheel.

Telegraph Key; C. Borchers, New York, N. Y.... 327,836
Consists of an auxiliary key-lever that is mounted by a transverse pivot-shaft in a supporting frame secured to the table in front of the key, said auxiliary lever being provided with a vertically adjustable screw-post that acts on the outer end of the main key-lever.

Undeground Conduit for Electric Wires; W. J. Ryckman, Brooklyn, N. Y., Assignor of one-half to Benj. Levi, of same place..... 307,872
The side walls are formed of recessed bracket-bricks having one or more semicircular channels in their upper horizontal parts, and of tapering key-bricks of smaller size than the end recesses of the bracket-bricks, said key-bricks having semicircular channels in their under sides and seats that fit into recesses of the bracket-bricks so as to interlock therewith when placed in position thereon.